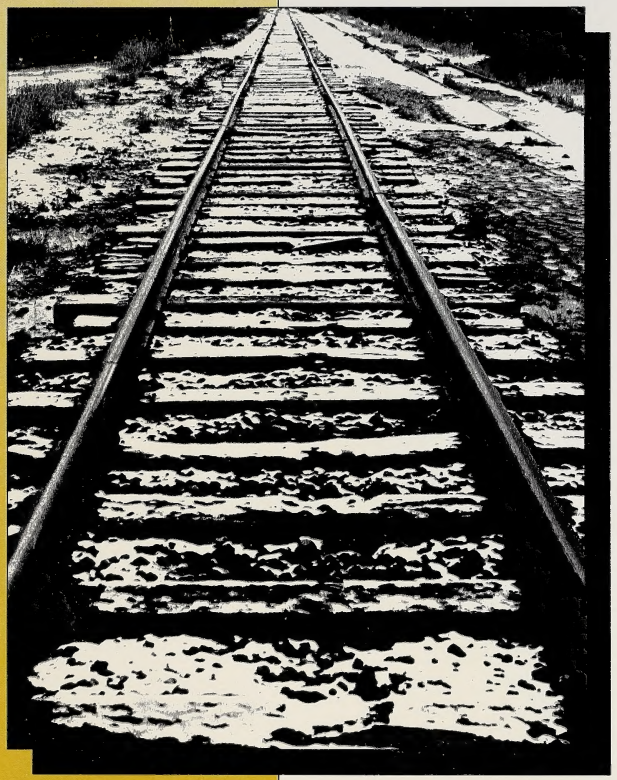
MATHEMATICS



8

MODULE 6

MEASUREMENT AND GEOMETRY

Distance Learning

Alberta EDUCATION

LEARNING FACILITATOR'S MANUAL

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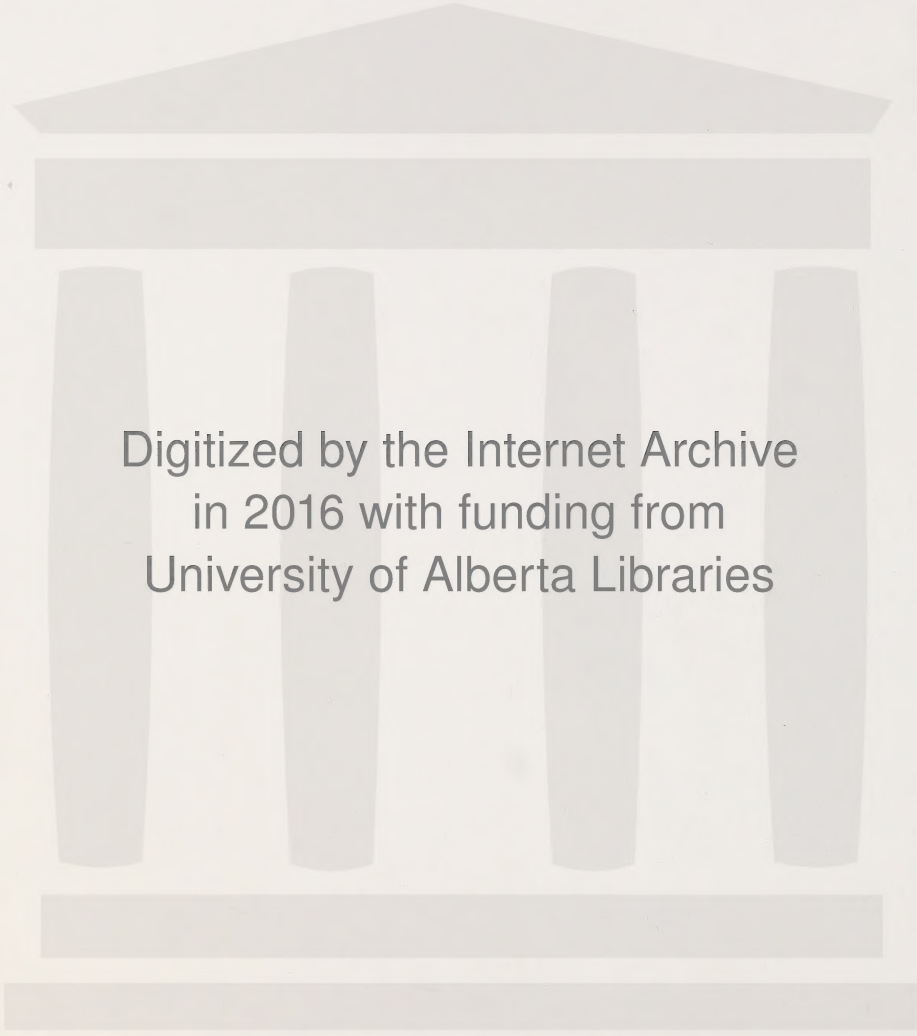
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Mathematics 8

Module 6: Measurement and Geometry

LEARNING FACILITATOR'S MANUAL

Note

This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Student's should not have access to these assignments or the final test until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

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Learning Facilitator's Manual
Module 6
Measurement and Geometry
Alberta Distance Learning Centre
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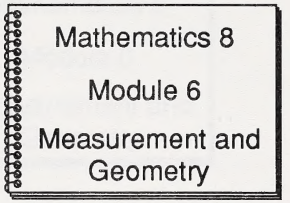
MODULE INTRODUCTION

What Lies Ahead

The Module Introduction gives the student an overview of Module 6.

Gathering Materials

For this section the student needs these items.



Guiding the Student

- Emphasize to the students that the goal of this module introduction is to preview the module and learn how it is evaluated.
- Discuss the learning process, time management, and evaluation with the students. See the suggestions on the next page.

The Learning Process

Each section of Module 6 deals with a different skill involving measurement and geometry.

Sections have several activities.

- Introductory Activities
- Practice Activities
- Extra Practice
- Concluding Activities

Remind the students that they will not be expected to do all the activities. You will help them decide what to do.

Time Management

Decide how long the student will need to complete the module. (The average student should spend about 9 weeks in a 40-week year to complete the module. It is recommended that students spend no more than 1 hour at a time doing mathematics.)

Evaluation

Explain to the students how their marks for Module 6 will be determined.

KEEPING SKILLFUL

What Lies Ahead

In this section the student will review these concepts.

- slides, flips, and turns
- congruent figures
- similar figures
- flip and turn symmetry
- tiling
- tesselations
- geometric designs

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 6

Measurement and Geometry

ruler

Guiding the Student

- Emphasize to the students that the goal of this section is to review previously-developed skills.
- Help the students check their answers to the review. If the students experienced difficulties with the review, you may wish to have them work on the appropriate sections in Mathematics 7, Module 6.

Review

1. What transformations (slides, turns, or flips) are suggested by the following activities?

   a. moving furniture into a new house

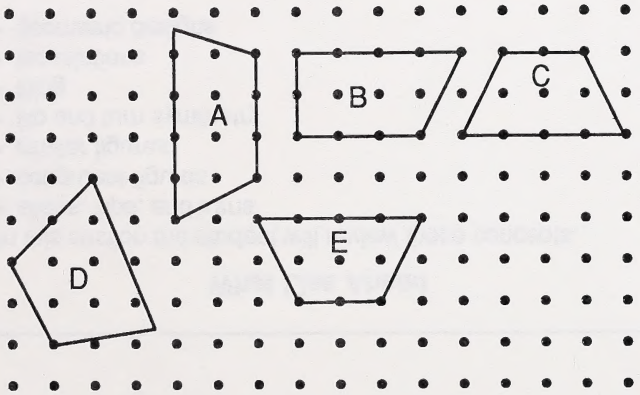
   b. playing both sides of a record

   c. resetting your watch

   d. raising a flag up a flag pole

   e. playing chess or checkers

2. Which of the following figures are congruent?



Suggested Answers

1. a. slides

   b. flips

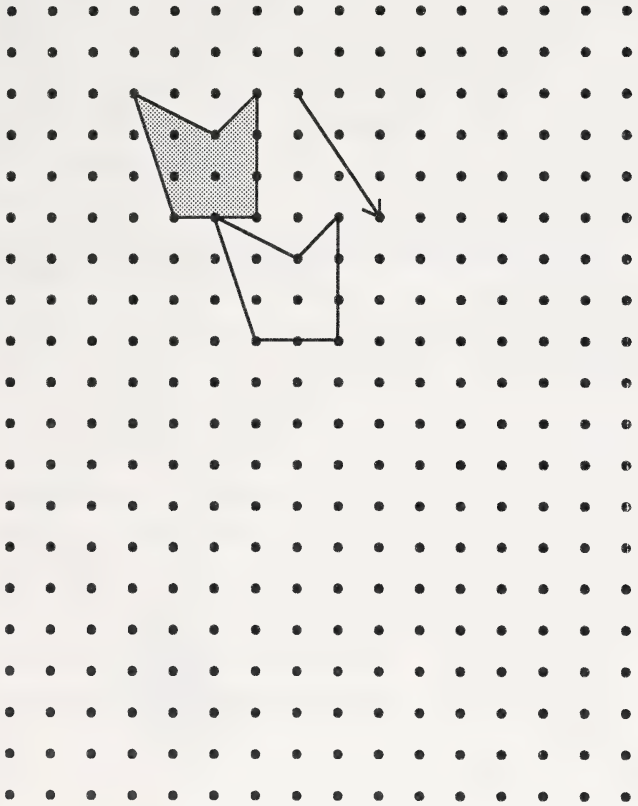
   c. turns

   d. slides

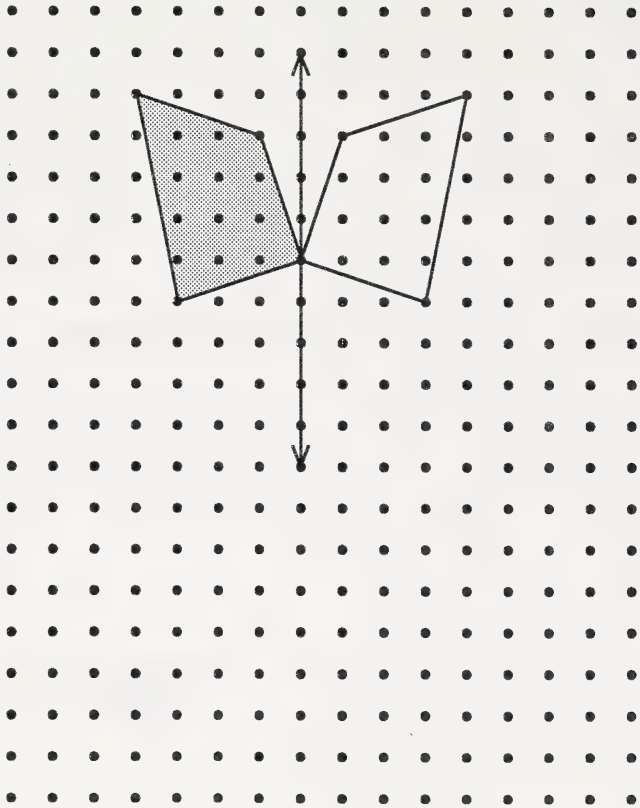
   e. slides

2. Figures C and E are congruent.

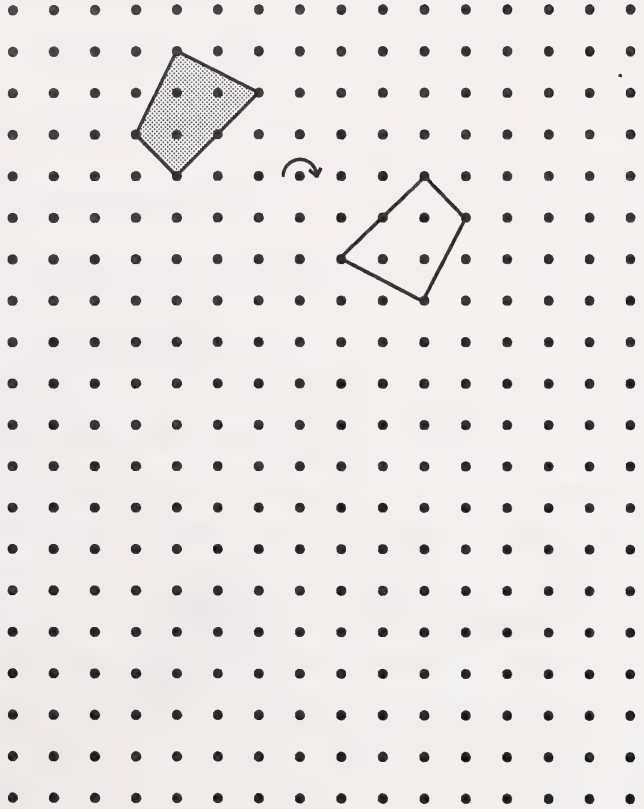
3. Draw the slide image for the given slide arrow. You may use the tracing paper provided in the Appendix.



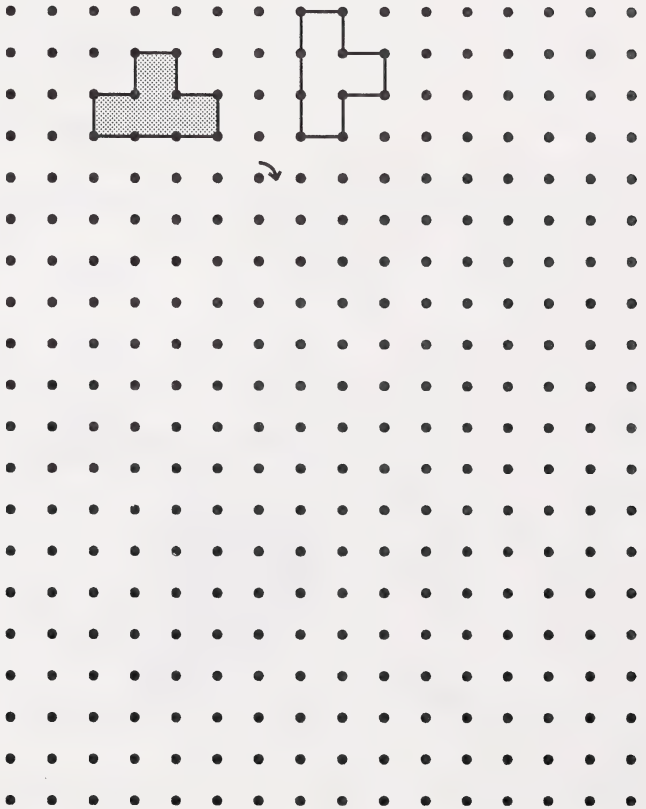
4. Draw the flip image for the given flip line. You may use the tracing paper provided in the Appendix.



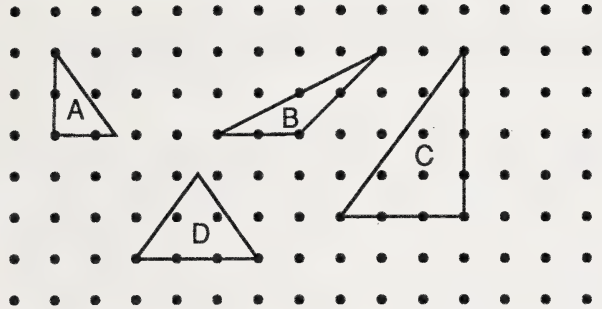
5. Draw the half-turn image for the given turn centre. You may use the tracing paper provided in the Appendix.



6. Draw the quarter-turn image for the given turn centre. You may use the tracing paper provided in the Appendix.

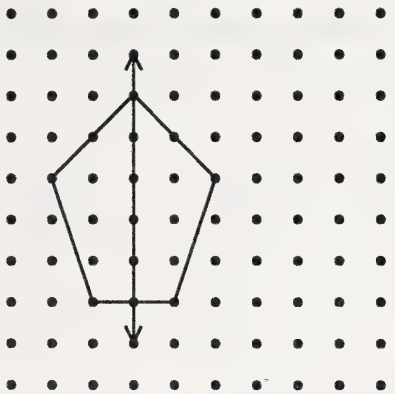


7. Which of the following figures are similar?



8. For each of the following figures, indicate whether or not the lines shown are lines of symmetry.

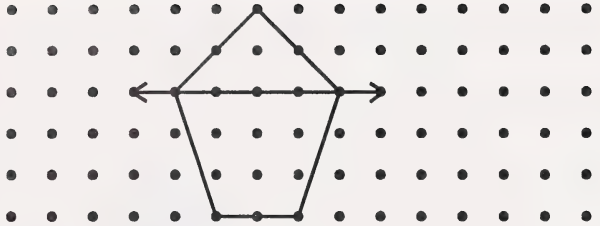
a.



7. Figures A and C are similar.

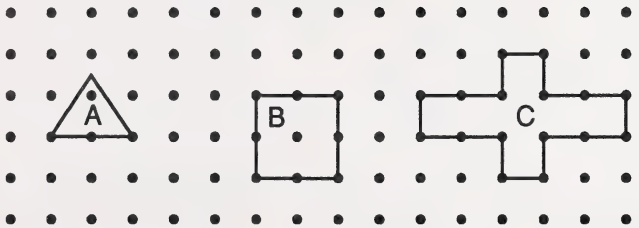
8. a. This is a line of symmetry.

b.



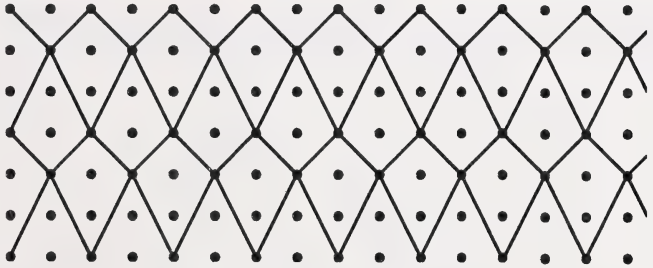
b. This is not a line of symmetry.

9. Which figure has a turn order of 2?



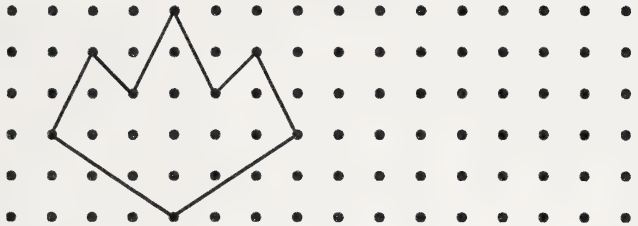
9. Figure C has a turn order of 2.

10. How many different shapes are used to make this tiling pattern?

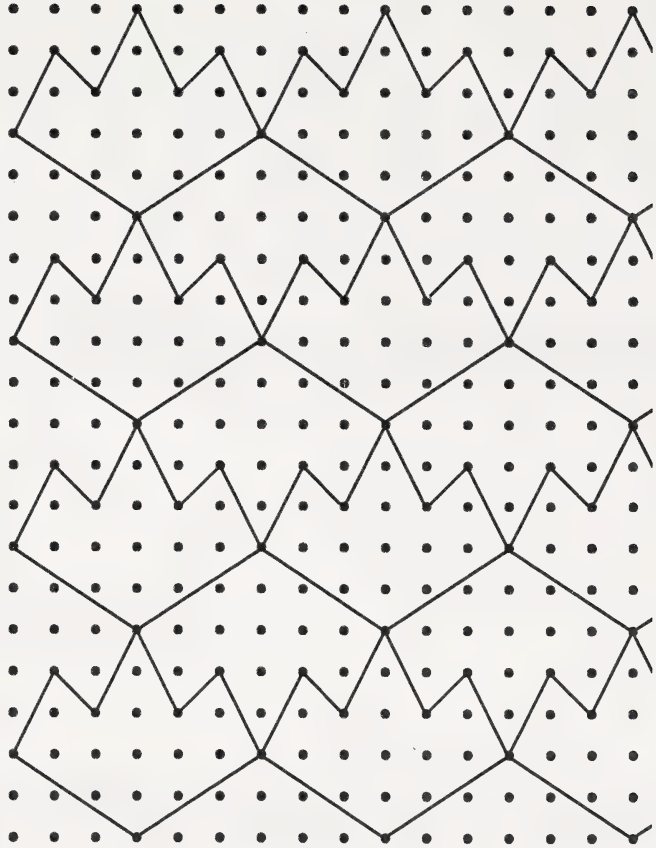


10. Only one shape is used.

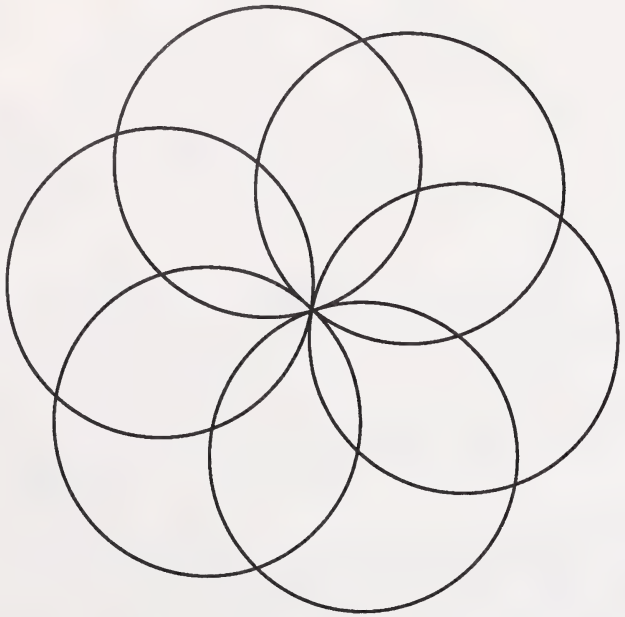
11. Create a tesselation with this shape. Use the dot paper provided at the right.



11.



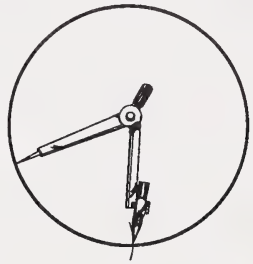
12. Construct this design with a compass. You can make the design larger or smaller if you wish.



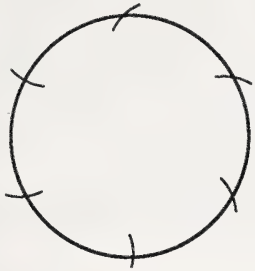
12. Students will use problem solving skills to discover how to draw this design. Here is one way to draw the design.

Step 1: Lightly draw a circle with a compass. This circle will later be erased.

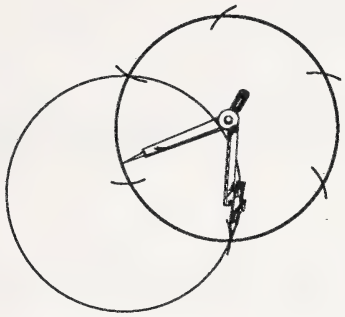
Step 2: Do not change the compass setting. Begin on any point on the circumference of the circle and make an arc that cuts the circle.



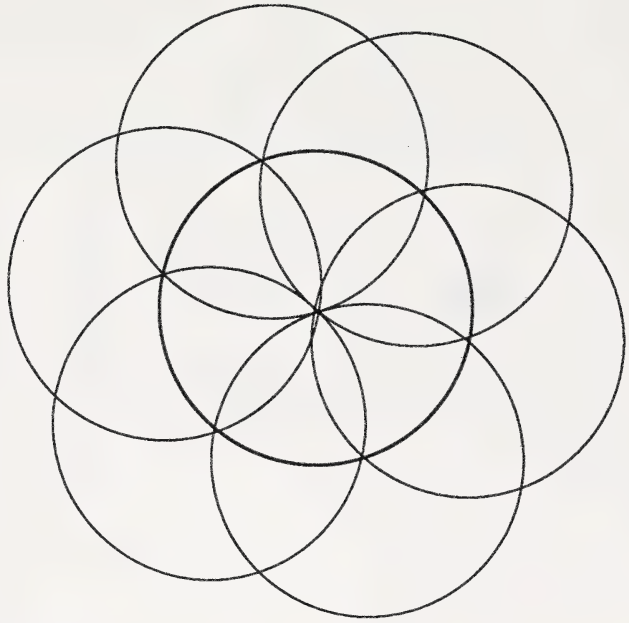
Step 3: Do not change the setting of the compass. Put the compass on the point where the arc cuts the circle and make another arc. Repeat this step until you have six arcs.



Step 4: Do not change the setting of the compass. Put the compass on the point where an arc cuts the circle. Draw a circle which connects two of the other arcs.



Repeat Step 4 until six circles are drawn.



Step 5: Erase the original circle.

Note

Some students will figure out how to draw the design, but will not have the coordination to actually draw the design. These students may simply need more practice using a compass. Other students will be able to use the compass, but will not see how to draw the design. They will need more practice in problem-solving.

GETTING SET

What Lies Ahead

This section will pretest these skills.

- interpreting lines, rays, and line segments
- interpreting polygons
- classifying angles
- classifying lines
- classifying polygons according to number of sides and angles
- classifying triangles
- classifying quadrilaterals
- interpreting right rectangular prisms and cubes

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 6

Measurement and Geometry

Guiding the Student

- Emphasize to the students that the goal of this section is to determine their strengths and weaknesses in geometry.
- Help the students check their answers to the pretest. It is not necessary for the students to correct errors at this time. See the last page of this section for further directions.

Pretest

1. Choose the best word to describe each of the following (e.g., ray, parallel, perpendicular, line segment, etc.).

a.

b.

c.

d.

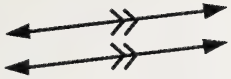
Suggested Answers

1. a. ray

b. line

c. perpendicular lines

d. line segment

e. 

f.

2. Choose the best word for each of the following angles (e.g., acute, obtuse, etc.).

a.

b.

e. parallel lines

f. intersecting lines

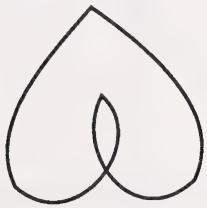
2. a. straight angle

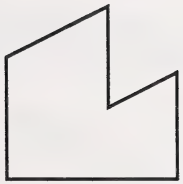
b. obtuse angle

c.

d.

3. Which of the following figures are polygons? Explain why.

a. 

b. 

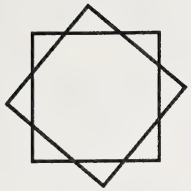
c. acute angle

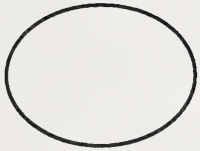
d. right angle

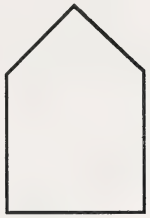
3. A polygon is a simple closed curve made up of line segments.

a. This figure is a non-simple closed curve, so it is not a polygon. This figure is not made up of line segments either.

b. This figure is a polygon because it is a simple closed figure, and it is also made up of line segments.

c. 

d. 

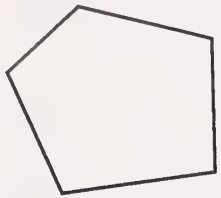
e. 

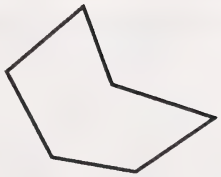
c. This figure is made up of line segments, but it is a non-simple closed curve.

d. This is not a polygon because it is not made up of line segments.

e. This is a polygon because it is a simple closed curve, and it is also made up of line segments.

4. Choose the name that shows the number of sides and angles for the following figures.

a. 

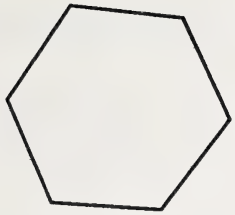
b. 

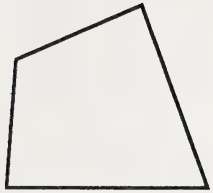
c.

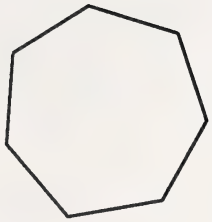
4. a. pentagon

b. hexagon

c. triangle

d. 

e. 

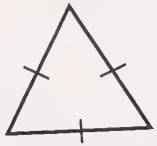
f. 

d. hexagon

e. quadrilateral

f. heptagon

5. Choose the best word to describe each of the following triangles.

a. 

b.

c.

d.

5. a. equilateral triangle

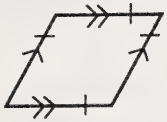
b. isosceles triangle

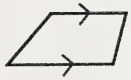
c. right triangle

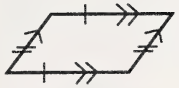
d. scalene triangle

6. Choose the best name for each of the following polygons.

a.

b. 

c. 

d. 

e.

6. a. rectangle

b. rhombus

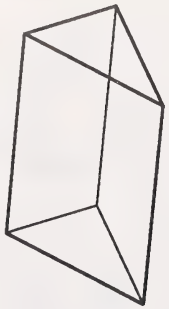
c. trapezoid

d. parallelogram

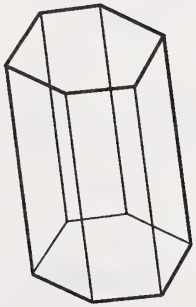
e. kite

7. Which of the following figures are right rectangular prisms?

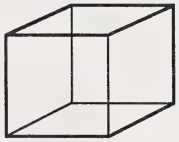
a.



b.



c.

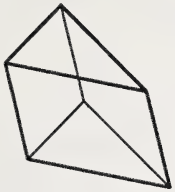


7. a. This is not a right rectangular prism. (It is a right triangular prism; the bases are triangles.)

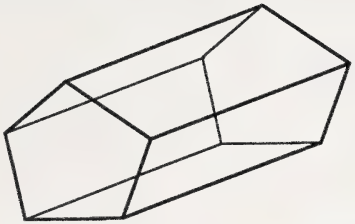
b. This is not a right rectangular prism. (It is a right hexagonal prism; the bases are hexagons.)

c. This is a right rectangular prism. All the faces are rectangles.

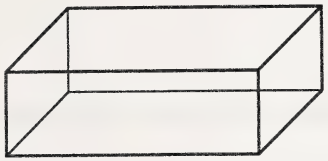
d.



e.



f.



d. This is not a right rectangular prism. (It is a right triangular prism; the bases are triangles.)

e. This is not a right rectangular prism. (It is a right pentagonal prism; the bases are pentagons.)

f. This is a right rectangular prism. All the faces are rectangles.

8. Which of the right rectangular prisms in Question 7 is a cube?

9. a. How many faces does a right rectangular prism have?

   b. How many edges does a right rectangular prism have?

   c. How many vertices does a right rectangular prism have?

8. The right rectangular prism in part 7. c. is a cube.

9. a. six

   b. twelve

   c. eight

Guiding the Student

Help the students decide what to do next. It is recommended that students review the notes in the sections which correspond to the questions in the pretest with which the students experienced success, and that the students do a few sample questions from the activities.

It is recommended that students carefully study the notes in the sections which correspond to the questions in the pretest with which students experienced difficulty, and that students do most of the questions in the activities.

Question	Skill	Section
1.	identifying rays, lines, and line segments	5
2.	identifying names of angles	4
3.	identifying polygons	3
4.	identifying names of polygons	6
5.	identifying names of triangles	7
6.	identifying names of quadrilaterals	8
7.	identifying right rectangular prisms	9
8.	identifying cubes	9
9.	identifying properties of right rectangular prisms	9

POINTS, CURVES, AND LINE SEGMENTS

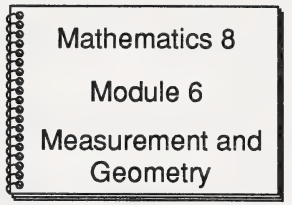
What Lies Ahead

In this section the student will learn these skills.

- naming points, line segments, and curves
- indicating congruent segments

Gathering Materials

For this section the student needs these items.



geoboard and elastics (optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Draw any design without lifting your pencil from the paper. You will have drawn a curve.

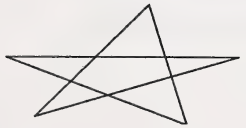
2. Which of the following curves can you trace without lifting your pencil from the paper? You may retrace or cross over a part you have already drawn.

   a.

   b.

   c.

   d.

   e. 

3. Which of the curves in Question 2 did not have endpoints?

Suggested Answers

1. Answer will vary.

2. a. yes

   b. yes

   c. no

   d. no

   e. yes

3. The curves in parts b. and e. did not have endpoints.

4. Do either part a. or part b. of this question.

   a. Use a geoboard and elastics. Make as many different shapes as you can by joining five points with segments.

   b. Use the dot paper from the Appendix. Make as many different shapes as you can by joining five points with segments.

5. How are the shapes that you made in Question 4 different?

4. a. Answers will vary.

   b. Answers will vary.

5. Some shapes have crossovers and some do not.

   Some shapes have all the sides turning outward, and some shapes have sides that turn inward.

Practice Activities

1. Is each of the following curves a polygon? Why or why not?

a.

b.

c.

d.

e.

f.

g.

Suggested Answers

1. a. No, it has no line segments.

   b. Yes, it is a closed curve, and it is made up of line segments.

   c. Yes, it is a closed curve, and it is made up of line segments.

   d. No, it is not made up of line segments.

   e. No, it has three line segments meeting at one point. This is a type of crossover.

   f. Yes, it is a closed curve, and it is made up of line segments.

   g. No, it is not made up entirely of line segments.

h.

i.

j.

h. Yes, it is a closed curve, and it is made up of line segments.

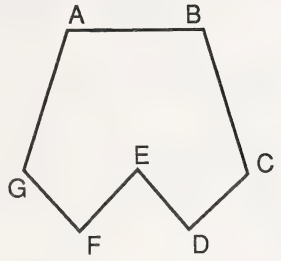
i. Yes, it is a closed curve and it is made up of line segments.

j. No, it has a cross over. Four line segment meet at one point.

2. Which of the polygons in Question 1 are convex polygons?

2. The polygons in parts b., f., h., and i. are convex polygons.

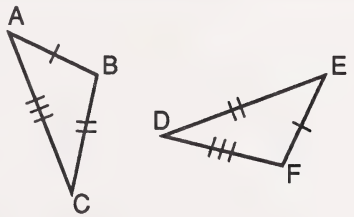
3. Name the sides adjacent to $\overline{AB}$ in this polygon.



3. $\overline{AG}$ and $\overline{BC}$ are adjacent to $\overline{AB}$.

4. Complete the blanks at the right. Use slash marks to indicate congruent sides on the figures.

a.

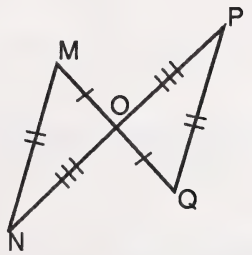


a. $\overline{AB} \cong$ $\overline{EF}$

$\overline{AC} \cong$ $\overline{ED}$

$\overline{BC} \cong$ $\overline{FD}$

b.



b. $\overline{MO} \cong$ $\overline{OQ}$

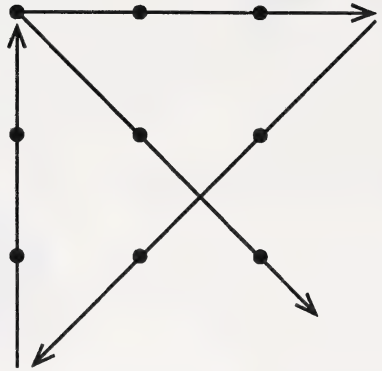
$\overline{MN} \cong$ $\overline{PQ}$

$\overline{NO} \cong$ $\overline{OP}$

Concluding Activities

Connect all the points to the right with only four line segments. Do not lift your pencil and do not retrace any lines.

Suggested Answers



RAYS AND ANGLES

What Lies Ahead

In this section the student will learn these skills.

- naming angles
- measuring angles
- classifying angles
- indicating congruent angles

Gathering Materials

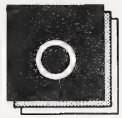
In this section the student needs these items.

Mathematics 8
Module 6
Measurement and Geometry

protractor
ruler

(optional)

SOLVE IT: Measuring Angles (AIT)



(optional)

LOGO

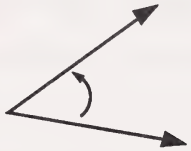
Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

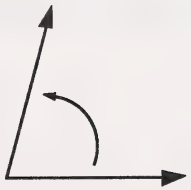
Introductory Activities

1. Measure the following angles with a protractor.

a.



b.



c.

d.

2. What do all the angles in Question 1 have in common?

Suggested Answers

1. a. 45°

b. 75°

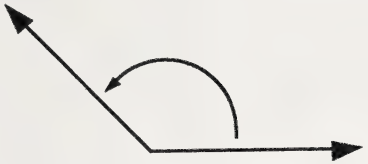
c. 60°

d. 30°

2. They are all less than 90°.

3. Measure the following angles.

a.



b.

c.

d.

3. a. 135°

b. 120°

c. 150°

d. 175°

4. What do all the angles in Question 3 have in common?

4. They are all greater than 90°.

Practice Activities

1. For each angle, tell whether it is a right angle, an acute angle, an obtuse angle, or a straight angle.

a.

b.

c.

d.

e.

Suggested Answers

1. a. obtuse angle

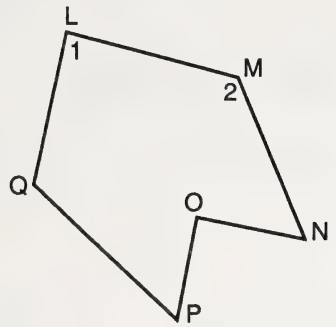
b. right angle

c. acute angle

d. straight angle

e. right angle

2. Give the measurements of the following angles in figure LMNOPQ.



a. ∠1

b. ∠Q

c. ∠2

d. ∠QPO

e. ∠PON

f. ∠N

2. a. 86°

b. 238°

c. 53°

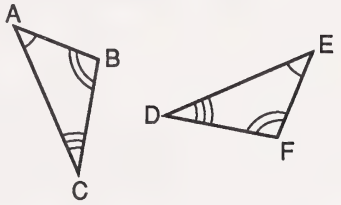
d. 57°

e. 90°

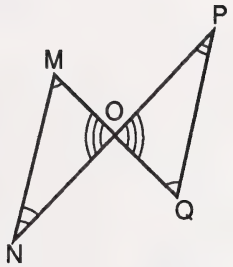
f. 305°

3. Complete the blanks at the right. Use arcs and slash marks to indicate congruent angles in the figures.

a.



b.



3. a. $\angle A \cong$ ∠E

$\angle B \cong$ ∠F

$\angle C \cong$ ∠D

b. $\angle M \cong$ ∠Q

$\angle N \cong$ ∠P

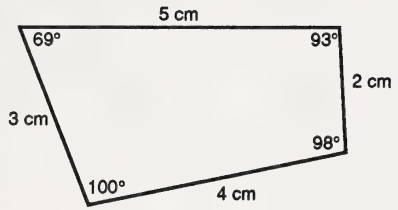
$\angle MON \cong$ ∠POQ

Concluding Activities

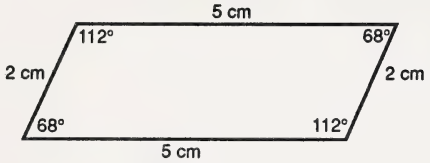
Print Alternative

1. Use a protractor and ruler to make figures that are congruent to the following figures.

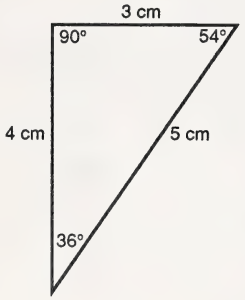
a.



b.

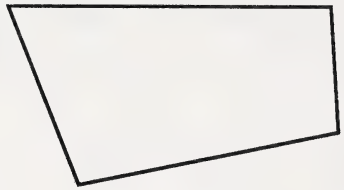


c.



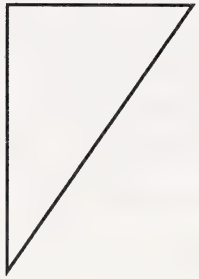
Suggested Answers

1. a.

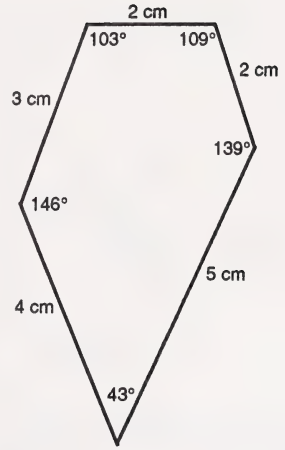


b.

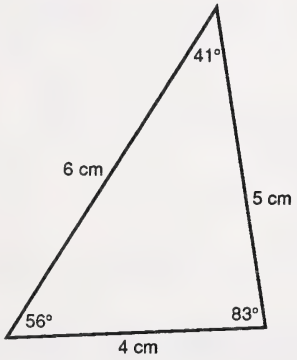
c.



d.

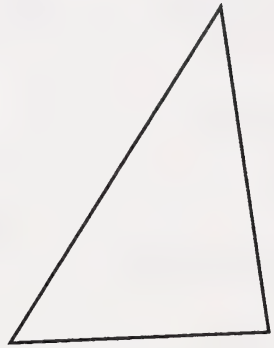


e.



d.

e.



Computer Alternative

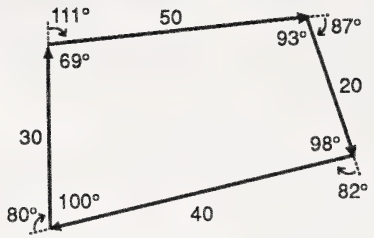
2. Use LOGO to draw figures similar to the ones in Question 1.

2.

Note

Students will discover that they can draw figures similar to those in Question 1 using commands RT and FD. For example, the following commands can be used to draw a figure similar to the one in part a.

FD 30
RT 111
FD 50
RT 87
FD 20
RT 82
FD 40
RT 80



Notice the turtle makes a complete trip of 360° around the screen, and ends in the same position:

$111° + 87° + 82° + 80° = 360°$

LINES

What Lies Ahead

In this section the student will learn these skills.

- classifying pairs of lines
- indicating parallel lines
- indicating perpendicular lines

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 6

Measurement and Geometry

protractor
ruler

Guiding the Student

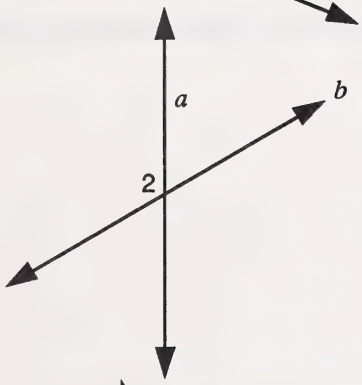
- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

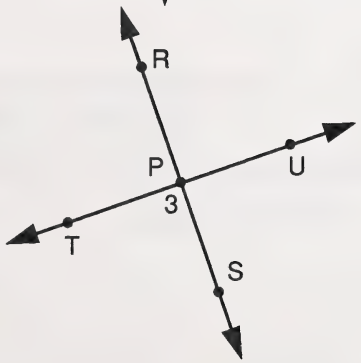
1. What are the measures of ∠1, ∠2, and ∠3 in the following questions?

a.

b.



c.



Suggested Answers

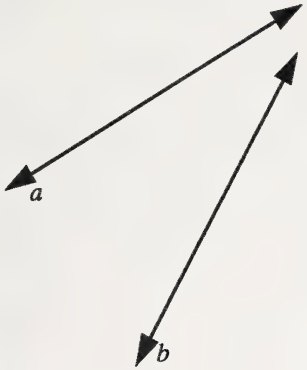
1. a. ∠1 = 30°

b. ∠2 = 120°

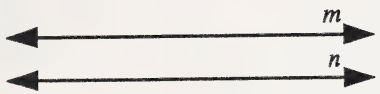
c. ∠3 = 90°

2. If you extended the following lines, do you think they will cross? Why or why not?

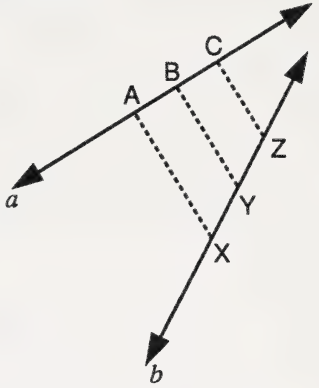
a.



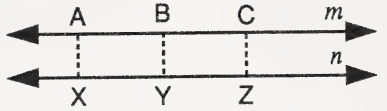
b.



2. a. Lines a and b will cross eventually because the vertical distance between the opposite points on the lines are decreasing.



b. Lines m and n will never cross because the vertical distance between opposite points on the lines are the same.



Practice Activities

1. Which of the following letters contain parallel lines?

   a. E

   b. V

   c. N

   d. Z

   e. H

Suggested Answers

1. a. yes

   b. no

   c. yes

   d. yes

   e. yes

2. Which of the following letters contain perpendicular lines?

a. E

b. V

c. N

d. Z

e. H

2. a. yes

b. no

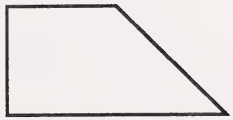
c. no

d. no

e. yes

3. Which of the following figures have parallel sides? Label the sides that are parallel.

a.

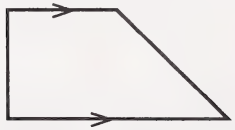
b. 

c.

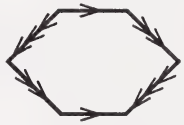
d.

3. a. no pairs of parallel sides

b. one pair of parallel sides



c. three pairs of parallel sides



d. no pairs of parallel sides

4. Which of the following figures have perpendicular sides? Label the sides that are perpendicular.

a.

b.

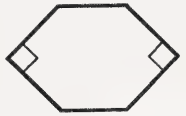
c.

d.

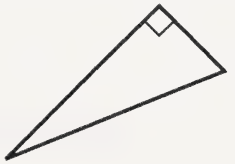
4. a. no pairs of perpendicular sides

b. one pair of perpendicular sides

c. two pairs of perpendicular sides



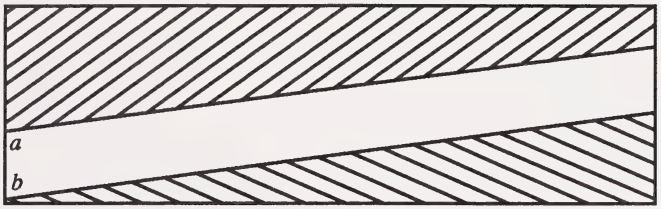
d. one pair of perpendicular sides



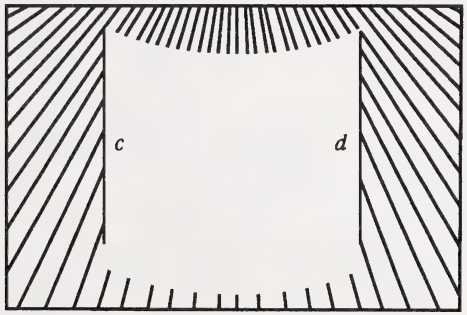
Concluding Activities

1. Things are not always what they appear to be.

   a. Are lines a and b parallel?



   b. Are lines c and d parallel?

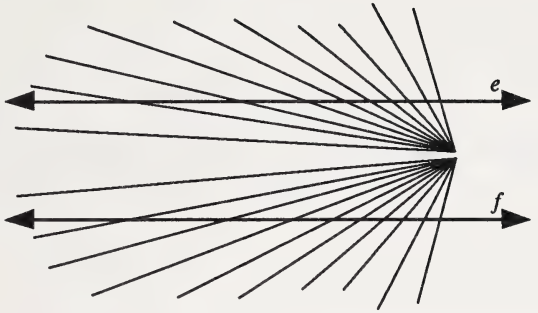


Suggested Answers

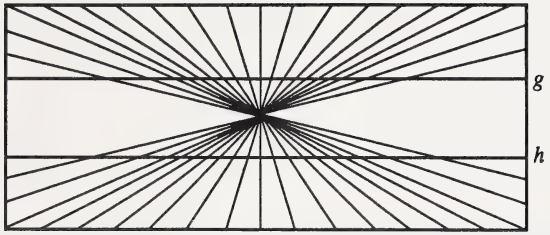
1. a. yes

   b. yes

c. Are lines e and f parallel?



d. Are lines g and h parallel?



2. Create your own optical illusion.

c. yes

d. yes

2. Answers will vary.

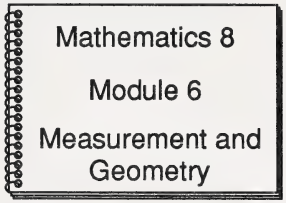
POLYGONS

What Lies Ahead

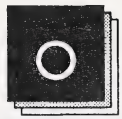
In this section the student will classify polygons according to the number of sides and angles.

Gathering Materials

For this section the student needs these items.



scissors



Problem Solving Strategies (MECC)

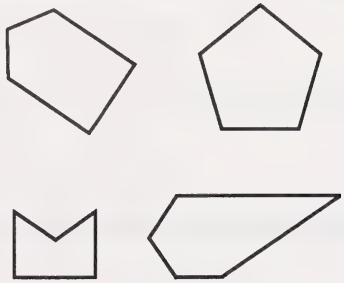
(optional)

Guiding the Student

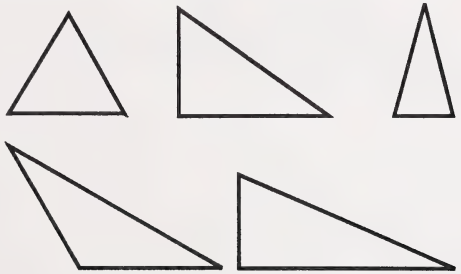
- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

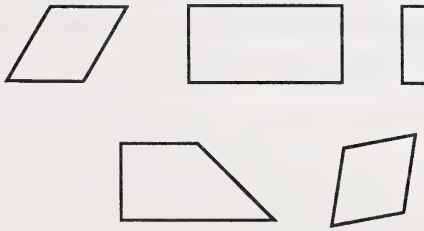
1. What characteristics do these polygons share?



2. What characteristics do these polygons share?



3. What characteristics do these polygons share?



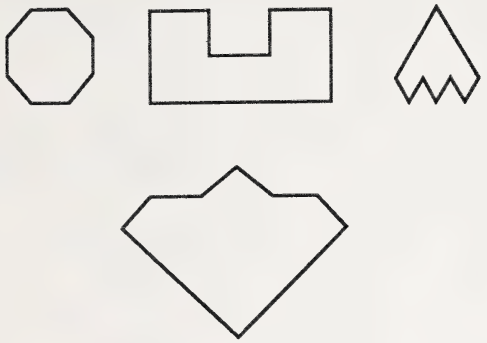
Suggested Answers

1. They all have five sides.

2. They all have three sides.

3. They all have four sides.

4. What characteristics do these polygons share?



4. They all have eight sides.

Practice Activities

1. Match the following figures with their names.

a.

b.

c.

d.

e.

f.

g.

h.

Suggested Answers

1.

g triangle

d quadrilateral

a pentagon

b hexagon

h octagon

e nonagon

c decagon

2. Which of the figures in Question 1 are regular polygons?

2. Figures b, g, and h are regular polygons.

Note

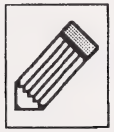
Figure d. has congruent sides, but not congruent angles.

Concluding Activities

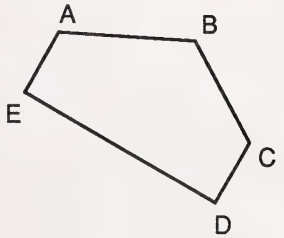
Computer Alternative

1. Do the program "Diagonals" in *Problem Solving Strategies* (MECC).

Print Alternative



2. The vertices of a polygon are refered to as **adjacent vertices** and **non-adjacent vertices**. Adjacent vertices are next to each other. Non-adjacent vertices are not next to each other. Name the vertices that are adjacent to A.

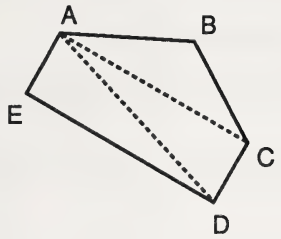


Suggested Answers

1. Computer corrected

2. B and E are adjacent to A.

3. A **diagonal** is a line segment joining two non-adjacent vertices in a polygon. For example, in figure ABCDE, there are two diagonals from A.



a. How many diagnonals are there from B?

b. How many diagonals are there in polygon ABCDE in total? Do not count the same segment twice.

4. a. Complete the following table. Use the polygons in the Appendix to help you.

Kind of Polygon	Number of Sides	Number of Diagonals
triangle		
quadrilateral		
pentagon		
hexagon		

b. Can you see a pattern in part a.? Explain the pattern.

c. Use the pattern to find the number of diagonals in a decagon. Do not use a drawing or count the diagonals.

3. a. two

b. five

4. a.

Number of Sides	Number of Diagonals	b. Pattern
3	0	
		+2
4	2	
		+3
5	5	
		+4
6	9	
		+5
c. 7	14	
		+6
8	20	
		+7
9	27	
		+8
10	35	

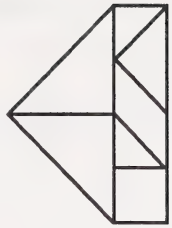
A decagon has 35 diagonals.

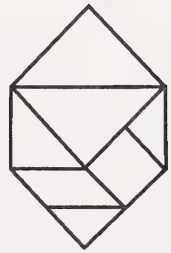
5. Use all the seven tangram pieces in the Appendix to form the following polygons.

   a. a pentagon

   b. a hexagon

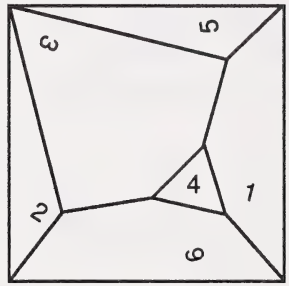
6. A polygon with twelve sides and angles is called a **dodecagon**. Use all six pieces of the regular dodecagon in the Appendix to form a square.

5. a. 

b. 

Note

Students will need the tangram pieces again in Section 8. They should put the pieces in an envelope and save them.

6. 

TRIANGLES

What Lies Ahead

In this section the student will learn this skill.
- classifying triangles

The student will also investigate the properties of triangles

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 6
Measurement and Geometry

protractor
MIRA
ruler

LOGO

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

Questions 1 to 4 require you to use the triangles from the Appendix.

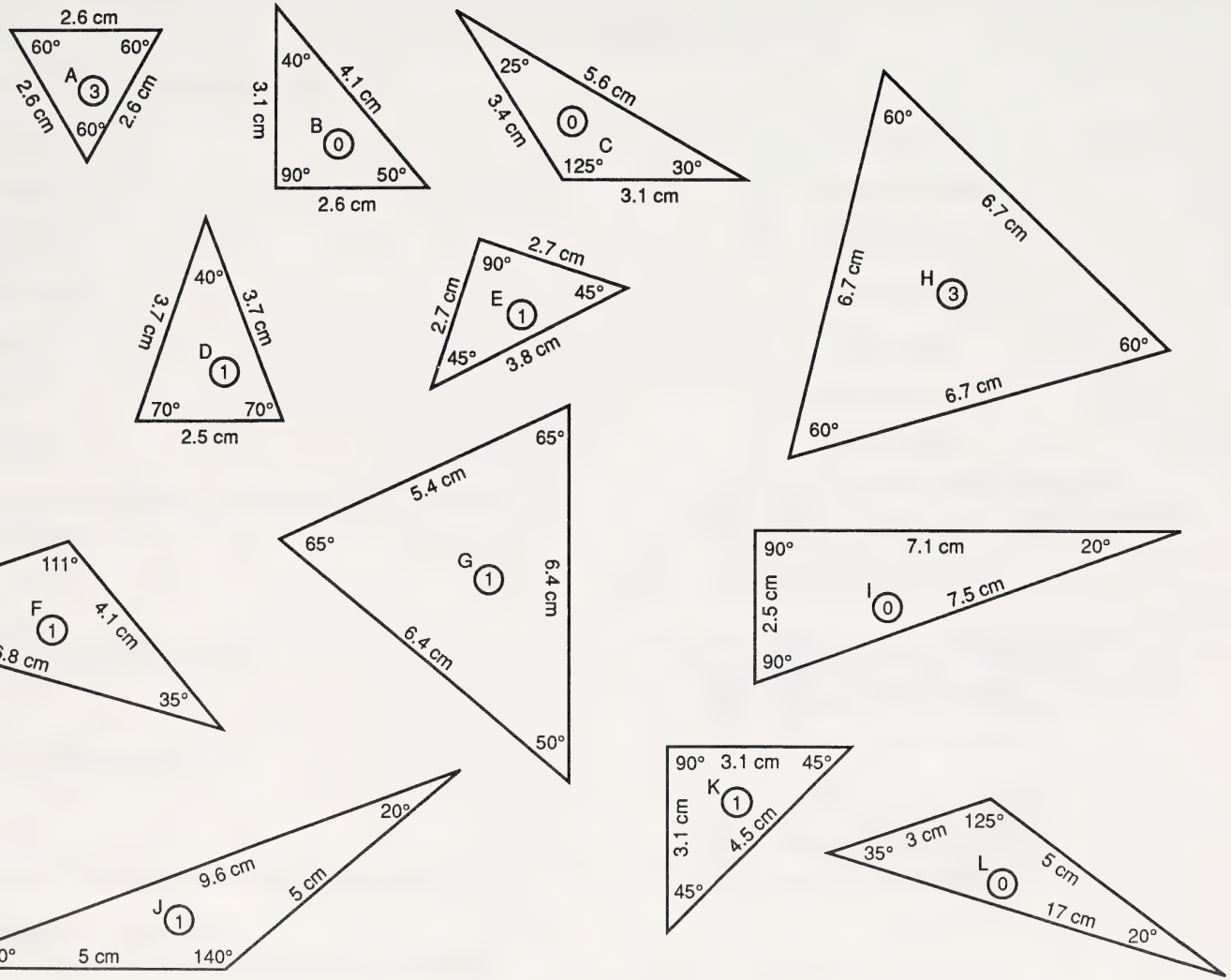
1. Use your protractor to carefully measure the angles in each of the triangles. Write the meaure inside each angle.

2. Measure the lengths of the sides of the triangles. Write the measures along the inside of the triangles.

3. Cut out each triangle and fold it (or use a MIRA) to determine the number of lines of symmetry. Put this number in the inside of the triangle.

Suggested Answers

See the next page for answers to Questions 1 to 3.


A
3
2.6 cm
60°
60°
2.6 cm
2.6 cm
60°
B
0
40°
4.1 cm
3.1 cm
90°
50°
2.6 cm
C
0
25°
5.6 cm
3.4 cm
125°
30°
3.1 cm
D
1
40°
3.7 cm
3.7 cm
70°
70°
2.5 cm
E
1
90°
2.7 cm
2.7 cm
45°
45°
3.8 cm
H
3
60°
6.7 cm
6.7 cm
60°
60°
6.7 cm
G
1
65°
5.4 cm
65°
6.4 cm
6.4 cm
50°
F
1
111°
4.1 cm
35°
4.1 cm
6.8 cm
35°
I
0
90°
7.1 cm
20°
2.5 cm
7.5 cm
90°
J
1
20°
9.6 cm
5 cm
20°
5 cm
140°
K
1
90°
3.1 cm
45°
3.1 cm
4.5 cm
45°
L
0
35°
3 cm
125°
5 cm
17 cm
20°

4. Sort the triangles into groups using the following criteria and record the triangles in each group.

   a. classification of largest angle (acute, right, obtuse)

   b. number of equal sides (0, 2, 3)

   c. number of lines of symmetry (0, 1, 3)

4. a. A, D, G, H are acute triangles.
   B, E, I, and K are right triangles.
   C, F, J and L are obtuse triangles.

   b. A and H have three congruent sides.
   D, E, F, G, J, and K have two congruent sides.
   B, C, I, and L have no congruent sides.

   c. A and H have three lines of symmetry.
   D, E, F, G, J, and K have one line of symmetry.
   B, C, F, and L have no lines of symmetry.

Practice Activities

1. Match the type of triangle with its description.

   a. equiangular

   b. right-angled

   c. acute-angled

   d. obtuse-angled

   e. equilateral

   f. isosceles

   g. scalene

2. Six triangles have the following measurements. Classify each triangle in two ways.

   a. 40°, 60°, 80°

   b. 60°, 60°, 60°

   c. 45°, 90°, 45°

   d. 120°, 40°, 20°

   e. 40°, 40°, 100°

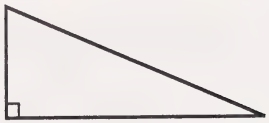
   f. 30°, 60°, 90°

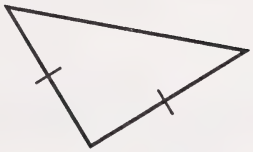
Suggested Answers

1. f two equal sides
   a three equal angles
   e three equal sides
   d one obtuse angle
   g no equal sides
   c three acute angles
   b one 90° angle

2. a. acute triangle, scalene triangle
   b. equiangular triangle, equilateral triangle
   c. right triangle, isosceles triangle
   d. obtuse triangle, scalene triangle
   e. obtuse triangle, isosceles triangle
   f. right triangle, scalene triangle

3. Classify each of the triangles in two ways.

a. 

b. 

c.

3. a. right triangle, scalene triangle

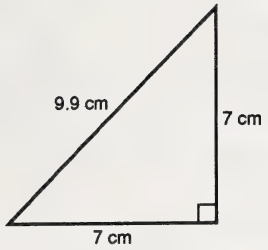
b. acute triangle, isosceles triangle

c. equiangular triangle, equilateral triangle

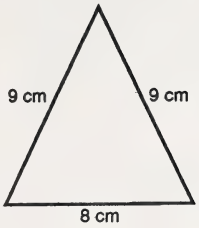
Extra Practice

Classify each triangle two ways.

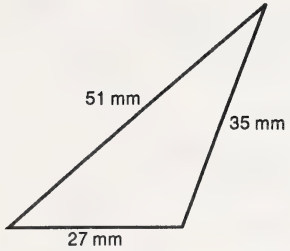
1.



2.



3.

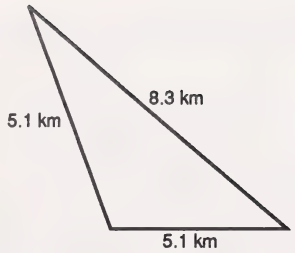


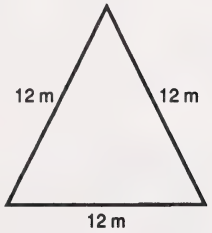
Suggested Answers

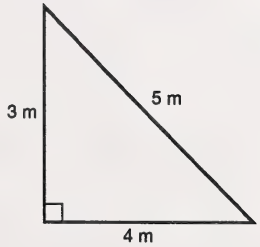
1. right triangle, isosceles triangle

2. acute triangle, isosceles triangle

3. obtuse triangle, scalene triangle

4. 

5. 

6. 

4. obtuse triangle, isosceles triangle

5. equilangular triangular, equilateral triangle

6. right triangle, scalene triangle

Concluding Activities

Print Alternative

1. Can a triangle be both of the following? Show why or why not.

   a. scalene and obtuse

   b. equilateral and obtuse

   c. scalene and right

   d. isosceles and right

   e. isosceles and equiangular

   f. equilateral and acute

   g. scalene and isosceles

2. Can a triangle have these characteristics? Show why or why not.

   a. two right angles

   b. two obtuse angles

   c. exactly two lines of symmetry

Suggested Answers

1. a. Yes, Question 3 in Extra Practice is scalene and obtuse.

   b. No, a triangle that is equilateral has three 60° angles.

   c. Yes, Question 6 in Extra Practice is scalene and right.

   d. Yes, Question 1 in Extra Practice is isosceles and right.

   e. No, an isosceles triangle has only two congruent angles.

   f. Yes, Question 5 in Extra Practice is equilateral and acute.

   g. No, scalene triangles have no sides congruent, and isosceles triangles have two sides congruent.

2. a. No, two right angles won't join to form a triangle.

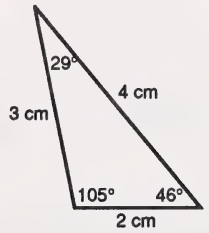
   b. No, two obtuse angles won't join to form a triangle.

   c. No, scalene triangles have no lines of symmetry, isosceles triangles have one line of symmetry, and equilateral triangles have three lines of symmetry.

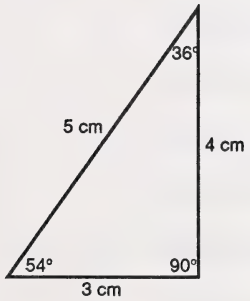
3. For each triangle, do the following.

   - List the angle measures in order of size from smallest to largest.
   - List the lengths of the sides in order from smallest to largest.

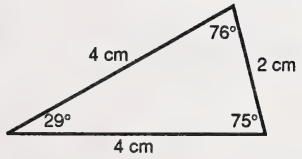
a.



b.



c.



3. a. 29°, 46°, 105°

   2 cm, 3 cm, 4 cm

b. 36°, 54°, 90°

   3 cm, 4 cm, 5 cm

c. 29°, 75°, 76°

   2 cm, 4 cm, 4 cm

4. Did you discover a pattern in Question 3? What seems to be the relationship between the measure of each angle and the length of the side opposite the angle?

5. For each triangle in Question 4, list the measure of the longest side and the sum of the measures of the other two sides.

6. a. What pattern did you notice in Question 5?

   b. Do you think a triangle can have sides that measure 3 cm, 4 cm, and 7 cm? Show why or why not.

4. The longest side is opposite the largest angle. The smallest side is opposite the smallest angle.

5. a. 4 cm, 5 cm

   b. 5 cm, 7 cm

   c. 4 cm, 6 cm

6. a. In each triangle the length of the longest side is less than the sum of the lengths of the two other sides.

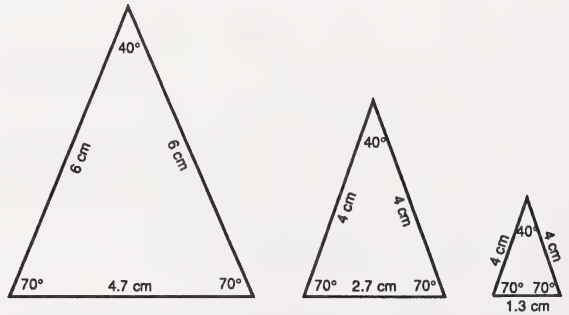
   b. No, a triangle cannot have these measures. The sides will not join. The length of the longest side must be less than the sum of the lengths of the other two sides.

7. Use a protractor and a ruler to draw each of the following figures.

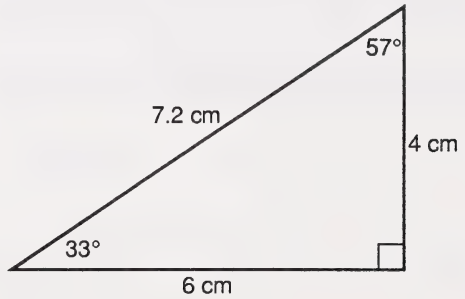
   a. an isosceles triangle with two 70° angles

   b. a right triangle with the two smaller sides measuring 4 cm and 6 cm

7. a. Many triangles can be drawn to fit this description. Here are three.



   b. Only one trianlge can be drawn to fit this description.



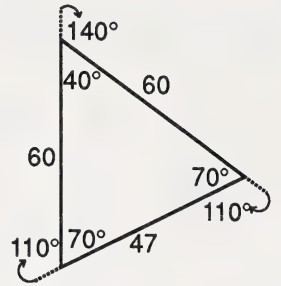
Computer Alternative

8. Draw triangles similar to those described in Question 7 on a computer using LOGO.

8. Because all the measurements are not given, students will probably want to draw the figures on paper first and measure the angles and sides that are not given.

a. Here is how to draw a triangle that fits this description.

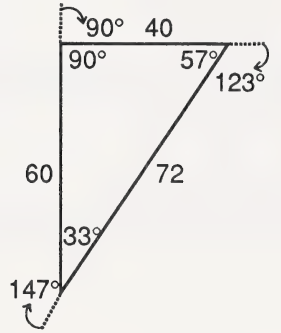
FD 60
RT 140
FD 60
RT 110
FD 47
RT 110



Notice the turtle does a complete trip of 360° around the screen.
140° + 110° + 110° = 360

b. Here is how to draw a triangle that fits this description.

FD 60
RT 90
FD 40
RT 123
FD 72
RT 147



Note

Students may wish to draw triangles similar to those on the Appendix page on the computer.

QUADRILATERALS

What Lies Ahead

In this section the student will learn this skill.
- classifying quadrilaterals

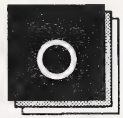
The student will also investigate the properties of quadrilaterals.

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 6
Measurement and Geometry

MIRA
protractor
ruler



LOGO

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

Questions 1 to 3 require you to use the quadrilaterals from the Appendix.

1. a. Do the following for each of the quadrilaterals.
   - Measure the sides and write the measures inside the figure.
   - Indicate the congruent sides.
   - Measure the angles and indicate their measures in the figure.
   - Indicate the right angles with the symbol ⌐.
   - Identify the parallel sides and indicate them with the symbols → or →→.

   b. Identify the quadrilaterals that have at least one pair of parallel sides.

   c. Identify the quadrilaterals that have two pairs of parallel sides.

   d. Identify the quadrilaterals that have congruent opposite sides.

   e. Identify the quadrilaterals that have four congruent sides.

   f. Identify those figures that have four right angles.

Suggested Answers

1. a. See the next page for answers.

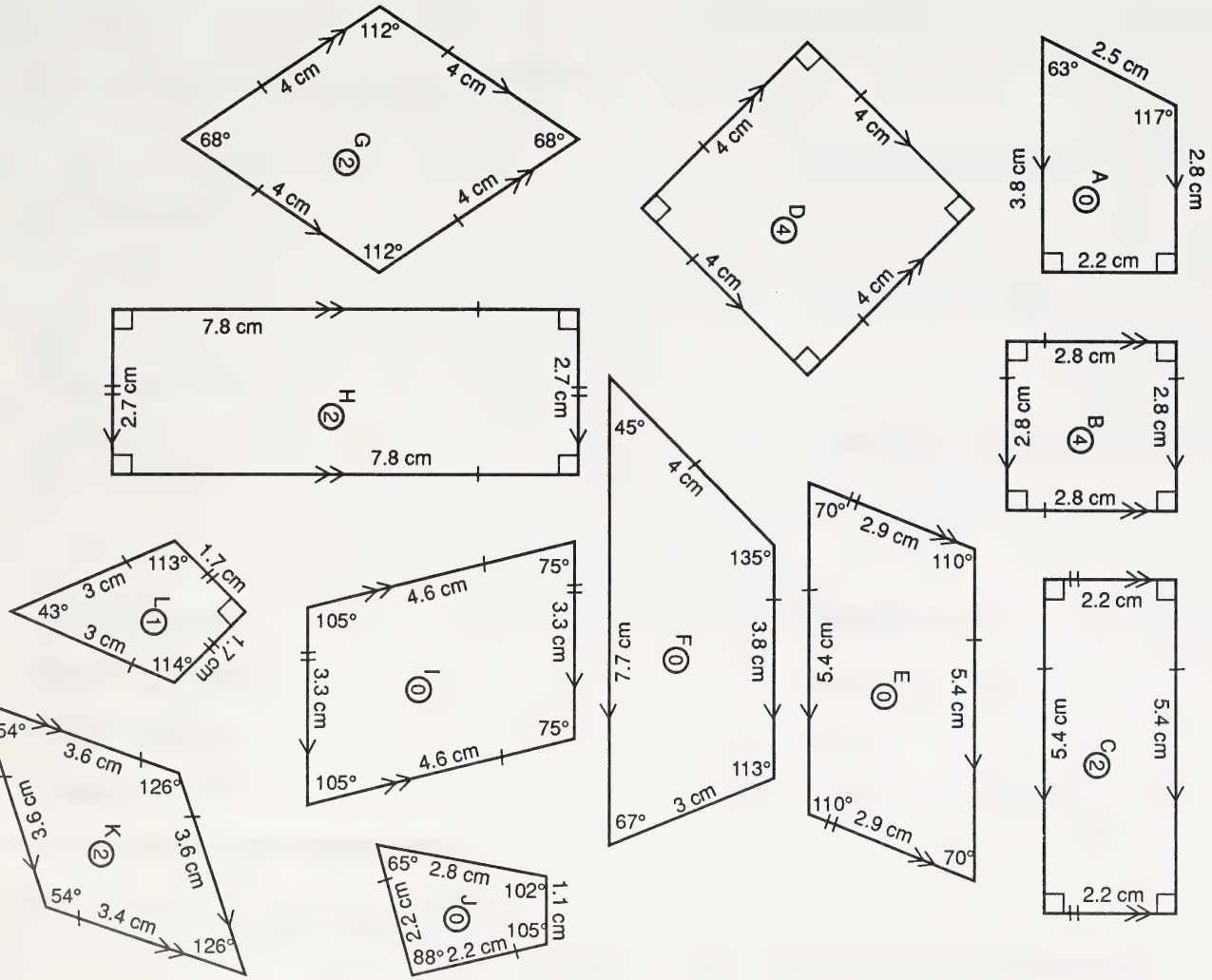
   b. Figures A, B, C, D, E, F, G, H, I, and K all have at least one pair of parallel sides.

   c. Figures B, C, D, E, G, H, I, and K have two pairs of parallel sides.

   d. Figures B, C, D, E, G, H, I, and K have congruent opposite sides.

   e. Figures B, D, G, and K have four congruent sides.

   f. Figures B, C, D, and H have four right angles.


G ②
112°
4 cm
4 cm
68°
68°
4 cm
4 cm
112°
D ④
4 cm
4 cm
4 cm
4 cm
A ⓪
2.5 cm
63°
117°
3.8 cm
2.8 cm
2.2 cm
H ②
7.8 cm
2.7 cm
2.7 cm
7.8 cm
B ④
2.8 cm
2.8 cm
2.8 cm
2.8 cm
L ①
1.7 cm
113°
3 cm
43°
3 cm
1.7 cm
114°
I ⓪
4.6 cm
75°
105°
3.3 cm
3.3 cm
75°
4.6 cm
105°
F ⓪
45°
4 cm
135°
7.7 cm
3.8 cm
113°
67°
3 cm
E ⓪
70°
2.9 cm
110°
5.4 cm
5.4 cm
110°
2.9 cm
70°
C ②
2.2 cm
5.4 cm
5.4 cm
2.2 cm
K ②
54°
3.6 cm
126°
3.6 cm
3.6 cm
54°
3.4 cm
126°
J ⓪
65°
2.8 cm
102°
1.1 cm
2.2 cm
105°
88°
2.2 cm

2. Cut out each figure that you examined in Question 1 and fold it (or use a MIRA) to determine the number of lines of symmetry. Put this number inside each quadrilateral.

3. Which figures have the following characteristics?

   a. no lines of symmetry

   b. one line of symmetry

   c. two lines of symmetry

   d. four lines of symmetry

2. See the answers on the previous page.

3. a. Figures A, E, F, I, and J

   b. Figure L

   c. Figures C, G, H, and K

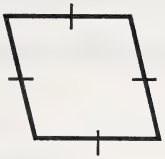
   d. Figures B and D

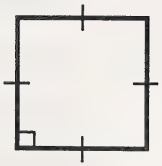
Practice Activities

1. Give two names that could be used for each of the following figures. Underline the one that best describes the figure.

a.

b.

c. 

d. 

Suggested Answers

1. a. trapezoid, <u>parallelogram</u>

b. parallelogram, <u>rectangle</u>

c. parallelogram, <u>rhombus</u>

d. rectangle, <u>square</u>

2. a. How is a square different from a rhombus?

   b. How are they similar?

3. Give the number of lines of symmetry for each figure.

   a. trapezoid

   b. parallelogram

   c. rectangle

   d. rhombus

   e. square

   f. kite

4. Answer **yes** or **no** to these questions.

   a. Is every rhombus a parallelogram?

   b. Is every square a rectangle?

   c. Is every parallelogram a rectangle?

   d. Is every rectangle a parallelogram?

   e. Is every square a rhombus?

   f. Is every rhombus a square?

   g. Is every rectangle a square?

   h. Is every trapezoid a parallelogram?

2. a. A square has four right angles.

   b. All four sides are congruent and there are two pairs of parallel sides.

3. a. zero

   b. zero

   c. two

   d. two

   e. four

   f. one

4. a. yes

   b. yes

   c. no

   d. yes

   e. yes

   f. no

   g. no

   h. no

5. Which quadrilaterals have congruent opposite angles and congruent opposite sides?

6. Draw (if possible) the quadrilaterals that have these characteristics.

   a. at least one right angle and four congruent sides

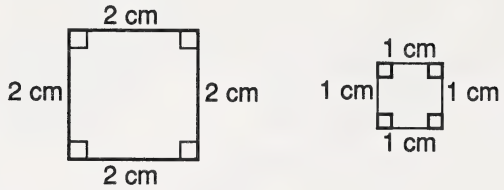
   b. exactly two right angles and no parallel sides

   c. exactly one right angle and one pair of parallel sides

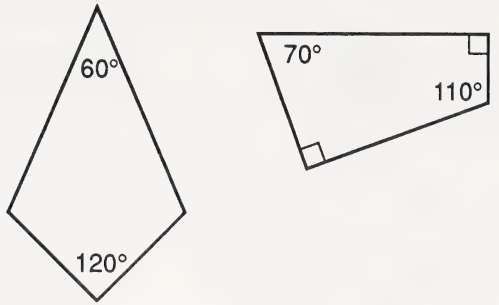
7. Name the quadrilaterals that you drew in Question 6.

5. parallelograms, rectangles, rhombuses, squares.

6. a. Several quadrilaterals that fit this shape can be drawn. Here are two.



   b. Several quadrilaterals that fit this description can be drawn. Here are two.



   c. No quadrilaterals can be drawn to fit this description.

7. All the quadrilaterals in part a. are squares.

   Some of quadrilaterals in part b. are kites. The rest are simply quadrilaterals.

Extra Practice

Complete the puzzle on the following page.[1]

Suggested Answers

See the following page for answers.

[1]Creative Publications for excerpt from *MIDDLE SCHOOL MATH WITH PIZZAZZ! BOOK D* ©1989, Sunnyvale, California 94086

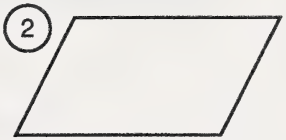
Why Didn't the Snobbish Potatoes Want Their Daughter to Marry a News Broadcaster?

Under each figure, circle the number-letter combination next to each word that correctly names the figure. Write the letter in the matching numbered box at the bottom of the page.

1

5-A parallelogram
16-0 rectangle
19-F square

2



25-E parallelogram
13-I rectangle
4-D rhombus

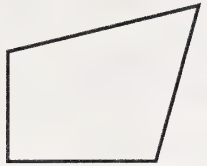
3

9-U quadrilateral
21-F parallelogram
1-H trapezoid

4

20-N parallelogram
11-T rectangle
23-A square

5

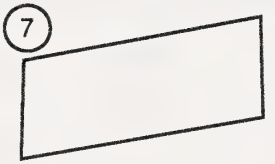


2-E quadrilateral
24-V parallelogram
8-P rhombus

6

19-O quadrilateral
15-L rectangle
6-S rhombus

7

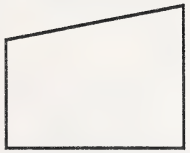


13-A quadrilateral
26-R parallelogram
7-N trapezoid

8

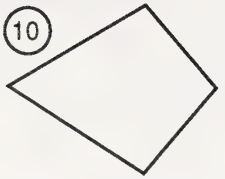
17-M rectangle
10-P square
14-S trapezoid

9



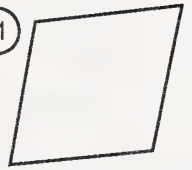
21-E parallelogram
18-I rhombus
8-J trapezoid

10



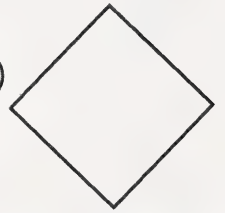
4-W quadrilateral
12-O parallelogram
24-N trapezoid

11



22-T quadrilateral
15-C rhombus
3-B square

12



10-S rectangle
18-M rhombus
24-T square

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
H	E		W	A	S		J	U	S	T		A		C	O	M	M	O	N		T	A	T	E	R

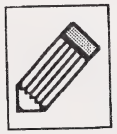
Concluding Activities

Computer Alternative

1. Draw different kinds of quadrilaterals on the computer using LOGO.

Print Alternative

Questions 2 to 5 require you to use the quadrilaterals from the Appendix.



2. For each figure, do the following.
   - Draw all the diagonals.
   - Measure the lengths of the diagonals and write the measures inside the figure.
   - Measure the angles at which the diagonals cross and indicate the right angles with the symbol ⌐¬ .

3. a. Which figures have congruent diagonals?

   b. What kind of quadrilaterals are these?

4. a. Which figures have diagonals that meet at right angles?

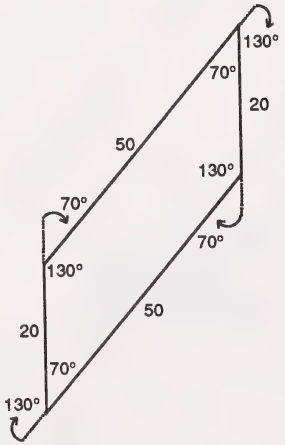
   b. What kind of quadrilaterals are these?

Suggested Answers

1. Students can draw quadrilaterals using the commands FD and RT.

   Example:

   FD 20
   RT 70
   FD 50
   RT 130
   FD 20
   RT 70
   FD 50
   RT 130



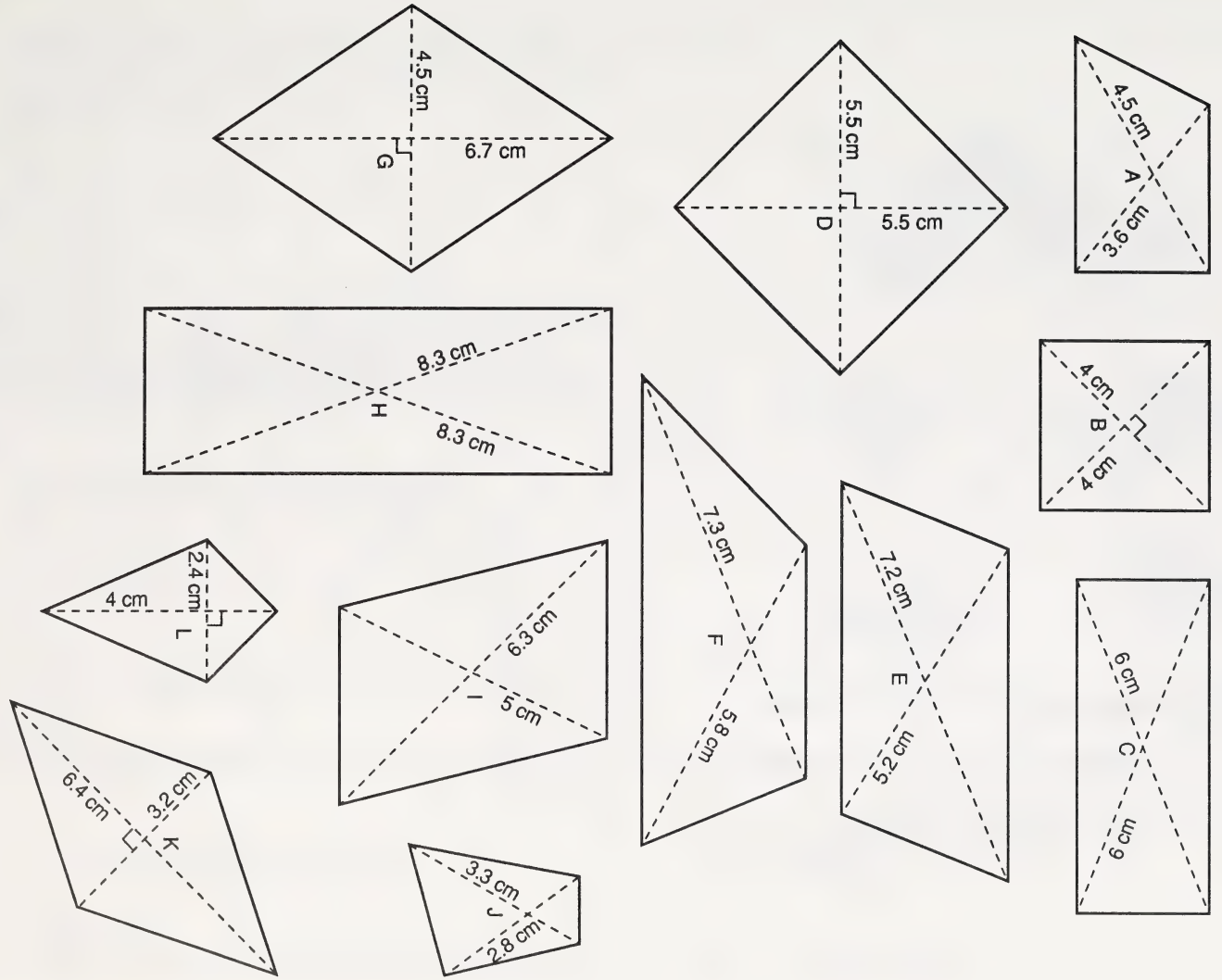
2. See the answers on the next page.

3. a. Figures B, C, D, and H

   b. rectangles and squares

4. a. Figures B, D, G, K, and L

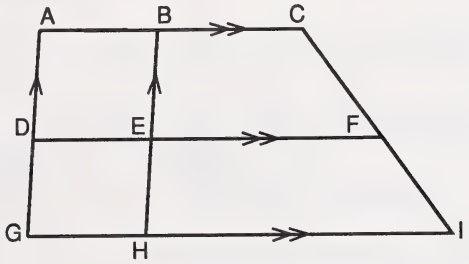
   b. squares, rhombuses, kites


4.5 cm
G
6.7 cm
5.5 cm
D
5.5 cm
4.5 cm
A
3.6 cm
8.3 cm
H
8.3 cm
4 cm
B
4 cm
7.3 cm
F
5.8 cm
7.2 cm
E
5.2 cm
2.4 cm
4 cm
L
6.3 cm
I
5 cm
6 cm
C
6 cm
6.4 cm
3.2 cm
K
3.3 cm
J
2.8 cm

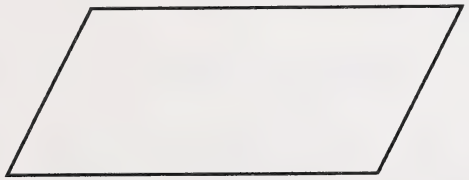
5. a. Which figures have congruent diagonals that meet at right angles?

   b. What kind of quadrilaterals are these?

6. Name three parallelograms and four trapezoids in this diagram.



7. Use a protractor to bisect each angle of this parallelogram. Extend the lines that bisect each angle until they intersect one another. What figure is created by the intersection of these lines? Hint: Bisect means to divide into two equal parts.



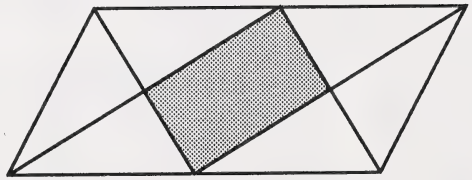
5. a. Figures B and D

   b. squares

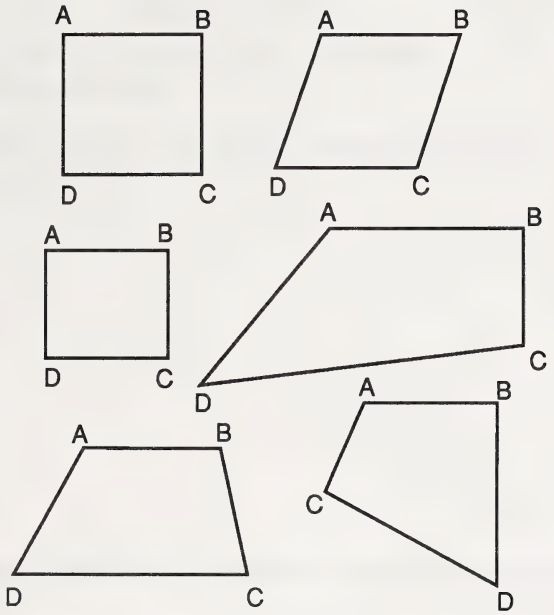
6. parallelograms: ABED, DEHG, ABHG

   trapezoids: ACIG, BCFE, EFIH, ACFD, and DFIG

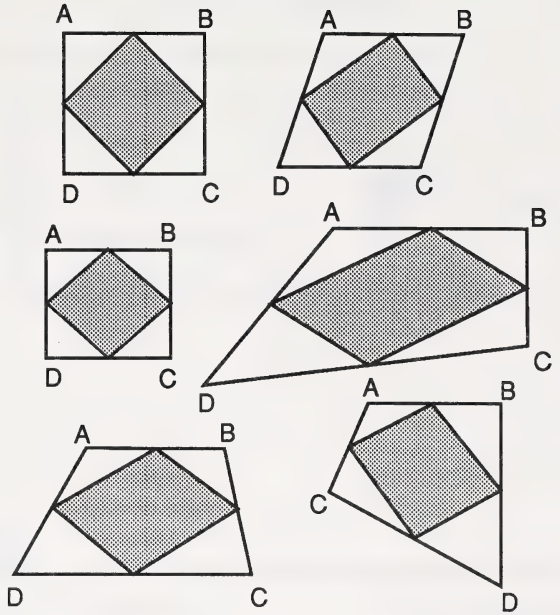
7. A rectangle is created.



8. Find the midpoints of each side of these figures. Join the midpoints together to form another four-sided figure. What do you notice about the opposite sides of these new four-sided figures?



8.

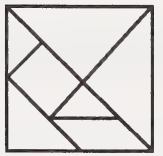


The opposite sides of these new four-sided figures are parallel and congruent.

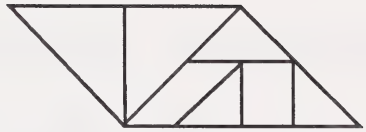
9. Use all seven tangram pieces from the Appendix to form a rectangle, a square, and a parallelogram.

9.

rectangle



square



parallelogram

RIGHT RECTANGULAR PRISMS

What Lies Ahead

In this section the student will learn these skills.
- classifying right prisms

The student will also investigate the properties of a right rectangular prism.

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 6
Measurement and Geometry

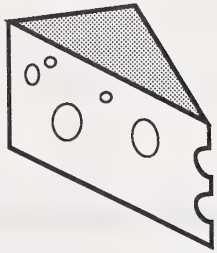
blocks

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Examine a wedge of cheese.



   a. How many flat surfaces (faces) does the wedge have?

   b. What shape is each flat surface?

   c. Which faces are congruent?

2. Examine an unsharpened pencil.

   a. How many flat surfaces (faces) does the pencil have?

   b. What shape is each flat surface?

   c. Which faces are congruent?

Suggested Answers

1. a. This wedge of cheese has five faces.

   b. The top and bottom faces are triangles. The side faces are rectangles.

   c. The top and bottom faces are congruent. Two of the rectangular faces are also congruent.

2. a. The unsharpened pencil has eight faces.

   b. The two end faces are hexagons. The other faces are rectangles.

   c. The two end faces are congruent hexagons. The other faces are congruent rectangles.

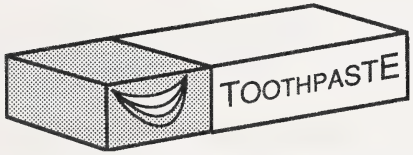
3. Examine a box of disposable cloths.

   a. How many flat surfaces does the box have?

   b. What shape is each flat surface?

   c. Which faces are congruent?

4. Examine a cereal box, toothpaste box, or tissue box.



   a. How many flat surfaces (faces) does the box have?

   b. What shape is each flat surface (face) of the box?

   c. Which faces are congruent?

3. a. The box has eight faces.

   b. The top and bottom faces are hexagons. The side faces are rectangles.

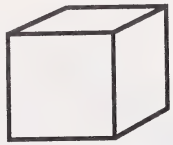
   c. The top and bottom faces are congruent. The side faces are congruent.

4. a. The box has six faces.

   b. Each face is a rectangle.

   c. The opposite faces are congruent.

5. Examine a sugar cube or child's building block.



a. How many flat surfaces (faces) does it have?

b. What shape is each surface (face)?

c. Which faces are congruent?

5. a. The block has six faces.

b. Each face is a square.

c. All faces are congruent.

Practice Activities

1. Examine a cereal box, toothpaste box, or tissue box.

   a. How many edges does a right rectangular prism have?

   b. Are any pairs of edges perpendicular?

   c. Are any pairs of edges parallel?

   d. How many vertices are there?

   e. Are opposite faces congruent?

Suggested Answers

1. a. There are twelve edges.

   b. Yes, the adjacent edges are perpendicular.

   c. Yes, the opposite pair of edges of a face are parallel.

   d. There are eight vertices.

   e. Yes.

2. Use blocks to build right rectangular prisms with the following dimensions. Then draw sketches of the right rectangular prisms on the dot paper provided in the Appendix.

   a. four blocks long, three blocks wide, two blocks high

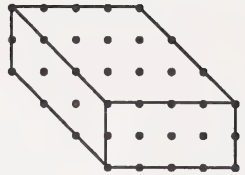
   b. five blocks long, four blocks wide, three blocks high

   c. five blocks longs, two blocks wide, three blocks high

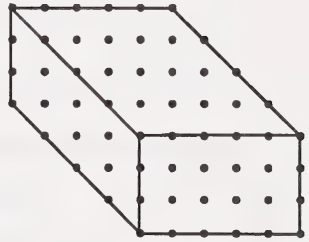
   d. three blocks long, three blocks wide, three blocks high

3. Which of the right rectangular prisms in Question 2 is a cube?

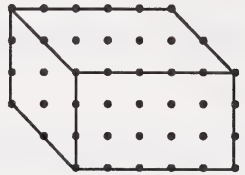
2. a.



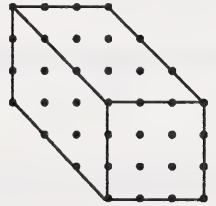
b.



c.



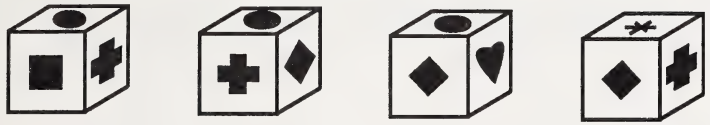
d.



3. 2. d. is a cube.

Concluding Activities

Here are four views of the same cube. Which designs are opposite each other on the cube?



Suggested Answers

The square is opposite the diamond.

The circle is opposite the star.

The heart is opposite the cross.

Note

Students may wish to mark on a sugar cube or a box to help them solve this problem.

SUMMARY

What Lies Ahead

In this section the student will review the skills learned in Part One.

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 6

Measurement and Geometry

Guiding the Student

- Emphasize to the students the goal of this section is to review Part One.
- Help the students check their answers to the pretest in Section 2 and correct any errors.

KEEPING SKILLFUL

What Lies Ahead

In this section the student will learn these skills.

- estimating and measuring length, mass, capacity, perimeter, area, and volume
- comparing the areas of figures with the same perimeter
- comparing the perimeters of figures with the same area
- relating volume and capacity in the metric system
- changing from one unit to another

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 6
Measurement and Geometry

ruler

Guiding the Student

- Emphasize to the students the goal of this section is to review previously developed skills.
- Help the students check their answers to the review and correct any errors. If the students experienced difficulties you may wish to have them do some of Mathematics 7, Module 6.

Review

1. Define *measurement*.

2. Why do you think the metric system is used by most of the countries in the world?

3. Can you ever measure absolutely accurately? Why or why not?

4. What do the following instruments measure?

   a.

   b.

Suggested Answers

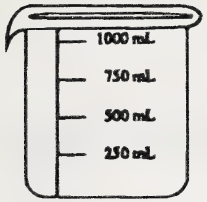
1. Measurement is the process of finding out how many measuring units are in something.

2. The metric system is based on multiples of 10, so it is simple, coherent, and logical.

3. Every measurement has a degree of uncertainty. The accuracy is influenced by the measuring instruments used and the individuals using them.

4. a. length

   b. volume or capacity

c. 

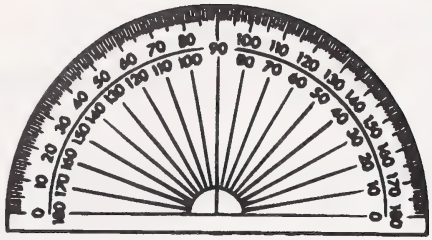
c. capacity or volume

d.

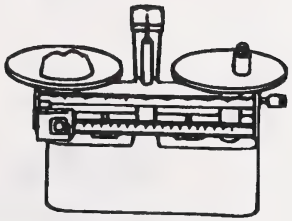
d. breadth of a gap (length across)

e.

e. mass

f. 

g.

h. 

i.

f. angles

g. depth

h. mass

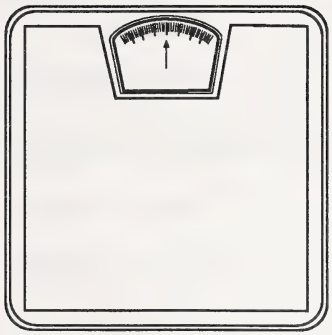
i. length

j.

j. capacity or volume

k.

k. length

l. 

l. mass

5. What unit would be appropriate to measure each of these quantities?

   a. the distance from Calgary to Banff

   b. the depth of the sea

   c. the length of a fire hose

   d. the width of a book

   e. the thickness of a sheet of paper

   f. your height

6. Is each statement reasonable? Answer **yes** or **no**.

   a. The pencil is 7 cm long.

   b. The mosquito is 7 m long.

   c. The flagpole is 7 mm long.

   d. The bike trail is 7 km long.

5. a. kilometres

   b. metres or kilometres

   c. metres

   d. centimetres

   e. millimetres or micrometres

   f. metres or centimetres

6. a. yes

   b. no

   c. no

   d. yes

7. Measure the following line segments.

   a. _____

   b. _____

   c. _____

8. What unit would you use to measure each of these masses?

   a. a stove

   b. a toaster

   c. a box of paper clips

   d. yourself

   e. a hair

7. a. 2 cm

   b. 5 cm

   c. 9 cm

8. a. kilograms

   b. grams or kilograms

   c. grams

   d. kilograms

   e. milligrams or micrograms

9. Is each statement reasonable? Answer **yes** or **no**.

   a. A motorcycle has a mass of 0.3 t.

   b. A tennis ball has a mass of 3 kg.

   c. A concrete block has a mass of 11 kg.

   d. A bicycle has a mass of 11 g.

   e. A basketball has a mass of 566 g.

   f. A bag of potato chips has a mass of 450 g.

9. a. yes
   b. no
   c. yes
   d. no
   e. yes
   f. yes

10. What unit would you use to measure the capacity of each of these items?

    a. a tube of toothpaste

    b. a carton of milk

    c. a tanker truck

    d. a bottle of pop

    e. a honey jar

    f. an eye dropper

10. a. millilitres
    b. litres
    c. kilolitres
    d. litres or millilitres
    e. millilitres
    f. millilitres

11. Is each statement reasonable? Answer **yes** or **no**.

    a. A hot-water tank has a capacity of 180 mL.

    b. A cereal bowl has a capacity of 225 mL.

    c. A drinking straw has a capacity of 5 mL.

    d. A water balloon has a capacity of 250 mL.

    e. A garbage can has a capacity of 15 L.

    f. A bottle cap has a capacity of 1 L.

11. a. no

    b. yes

    c. yes

    d. yes

    e. yes

    f. no

12. Which unit would you use to measure the area of each of the following items?

    a. a garden

    b. a place mat

    c. a farm

    d. a province

    e. a stamp

12. a. square metres

    b. square centimetres

    c. square hectometres or hectares

    d. square kilometres

    e. square centimetres or square millimetres

13. Is each statement reasonable? Answer **yes** or **no**.

    a. The area of a hockey rink is 1586 km^2.

    b. The area of a credit card is 46.75 cm^2.

    c. The area of a felt pennant is 0.3 m^2.

    d. The area of a stop sign is 4320 cm^2.

    e. The area of a ballpark is 5.1 ha.

14. What unit would you use to measure the volume of each of the following items?

    a. a hamster cage

    b. a moving truck

    c. a box of cereal

    d. a swimming pool

15. Is each statement reasonable? Answer **yes** or **no**.

    a. The volume of a walnut is 12 m^3.

    b. The volume of a washroom is 0.1 m^3.

    c. The volume of a softball is 480 cm^3.

    d. The volume of a loaf of bread is 3500 m^3.

13. a. no

    b. yes

    c. yes

    d. yes

    e. yes

14. a. cubic centimetres

    b. cubic metres

    c. cubic centimetres

    d. cubic metres

15. a. no

    b. no

    c. yes

    d. no

16. Complete the following unit conversions.

a. 30 cm = ▒ mm

b. 152 mm = ▒ m

c. 3 L = ▒ mL

d. 518 g = ▒ kg

17. Complete the following conversions.

a. 13 mL = ▒ cm^3

b. 2 L = ▒ cm^3

16. a. 300 mm

b. 0.152 m

c. 3000 mL

d. 0.518 kg

17. a. 13 cm^3

b. 2000 cm^3

GETTING SET

What Lies Ahead

In this section the student will learn these skills.

- calculating the perimeter of rectangles, parallelograms, and regular polygons using formulas
- calculating the circumference of circles using a formula
- calculating the area of rectangles and squares, parallelograms, triangles, trapezoids, and circles using formulas
- calculating the volume of right rectangular prisms and cubes using formulas

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 6

Measurement and Geometry

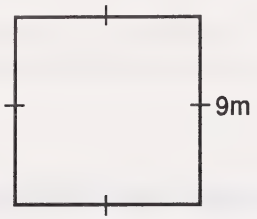
Guiding the Student

- Emphasize to the students the goal of this section is to discover their strengths and weaknesses.
- Help the students check their answers to the pretest in this section. It is not necessary to correct any errors at this time. See the last page of this section for further directions.

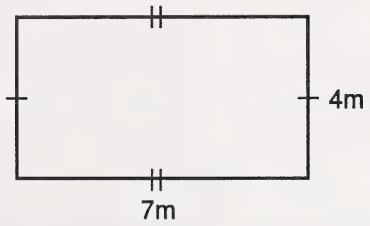
Pretest

1. Write a formula and then find the perimeter of each polygon.

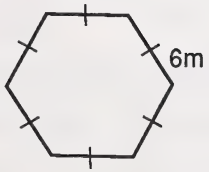
a.



b.



c.



Suggested Answers

1. a. $P = 4s$

$= 4 \times 9$

$= 36$

The perimeter is 36 m.

b. $P = 2\ell + 2w$

$= 2 \times 7 + 2 \times 4$

$= 14 + 8$

$= 22$

The perimeter is 22 m.

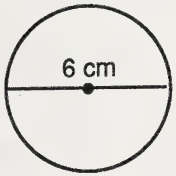
c. $P = 6s$

$= 6 \times 6$

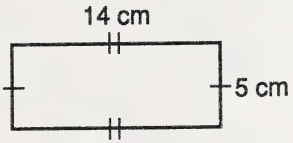
$= 36$

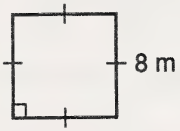
The perimeter is 36 m.

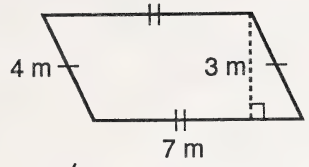
2. Write a formula and find the circumference of the circle.

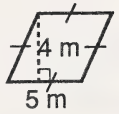


3. Write a formula and find the area of the following quadrilaterals.

a.


b.


c.


d.


2. $C = 2\pi d$ or $C = 2\pi r$

$\doteq 3.14 \times 6$ $\doteq 2 \times 3.14 \times 3$

$\doteq 18.8$ $\doteq 18.8$

The perimeter is 18.8 cm.

3. a. $A = \ell \times w$

$= 14 \times 5$

$= 70$

The area is 70 cm^2.

b. $A = \ell \times w$

$= 8 \times 8$

$= 64$

The area is 64 m^2.

c. $A = \ell \times w$

$= 7 \times 3$

$= 21$

The area is 21 m^2.

d. $A = \ell \times w$

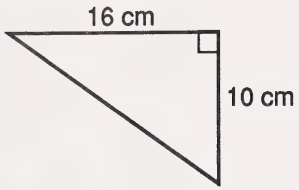
$= 5 \times 4$

$= 20$

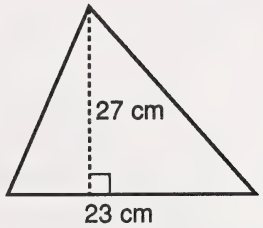
The area is 20 m^2.

5. Write a formula and find the area of the following triangles.

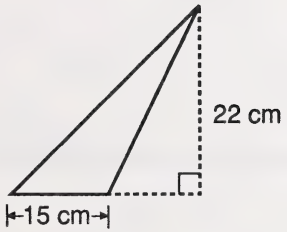
a.



b.



c.



5. a. $A = \frac{1}{2}bh$

$= \frac{1}{2} \times 16 \times 10$

$= 80$

The area is 80 cm^2.

b. $A = \frac{1}{2}bh$

$= \frac{1}{2} \times 23 \times 27$

$= 310.5$

The area is 310.5 cm^2.

c. $A = \frac{1}{2}bh$

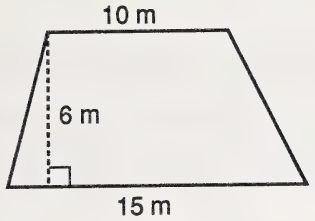
$= \frac{1}{2} \times 15 \times 22$

$= 165$

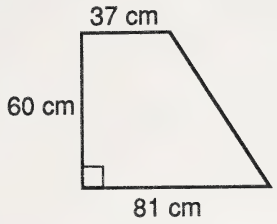
The area is 165 cm^2.

6. Write a formula and find the area of the following trapezoids.

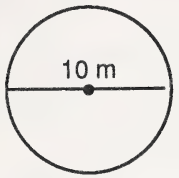
a.



b.



7. Write a formula and find the area of the circle.



6. a. $A = \dfrac{h(b_1 + b_2)}{2}$

$= \dfrac{6 \times (15 + 10)}{2}$

$= \dfrac{6 \times 25}{2}$

$= 75$

The area is 75 m^2.

b. $A = \dfrac{h(b_1 + b_2)}{2}$

$= \dfrac{60 \times (81 + 37)}{2}$

$= \dfrac{60 \times 118}{2}$

$= 3540$

The area is 3540 cm^2.

7. $A = \pi r^2$

$\doteq 3.14 \times 5^2$ $\quad r = \frac{1}{2}d$

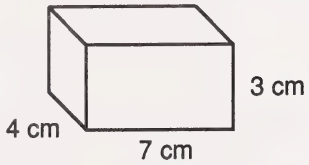
$\doteq 3.14 \times 25$

$= 78.5$

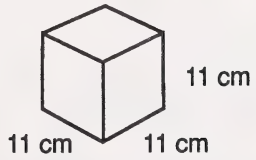
The area is 78.5 m^2.

8. Write a formula and find the volume of the following right rectangular prisms.

a.



b.



8. a. $V = \ell \times w \times h$

$= 7 \times 4 \times 3$

$= 84$

The volume is 84 cm^3.

b. $V = \ell \times w \times h$

$= 11 \times 11 \times 11$

$= 1331$

The volume is 1331 cm^3.

Guiding the Student

Help the students decide what to do next. It is recommended that students review the notes in the sections which correspond to the questions in the pretest with which the students experienced success, and that the students do a few sample questions from the activities.

It is recommended that students study the notes in the sections which correspond to the questions in the pretest with which the students experienced difficulty, and that students do most of the questions in the activities.

Question	Skill	Section
1.	using formulas to find perimeter indirectly	13
2.	using a formula to find circumference indirectly	14
3. a., b.	using formulas to find the area of rectangles and squares indirectly	15
3. c., d.	using a formula to find the area of parallelograms indirectly	16
5.	using a formula to find the area of triangles indirectly	17
6.	using a formula to find the area of trapezoids indirectly	18
7.	using a formula to find the area of circles indirectly	19
8.	using a formula to find the volume of right rectangular prisms indirectly	20

PERIMETER

What Lies Ahead

In this section the student will learn this skill.

- using formulas as indirect measures of the perimeter of polygons

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 6

Measurement and Geometry

metric ruler or metre stick, string, scissors

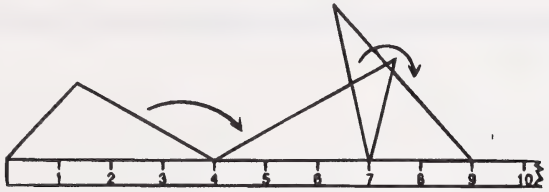
Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

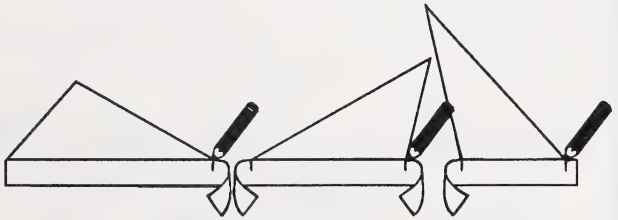
Introductory Activities

1. Cut out the figures labelled *Section 13 Polygons* in the Appendix. Then use one or more of the following methods to find the perimeter of each figure. Record the perimeter of each figure on the figure.

   a. Find the perimeter of the figures by "rolling" the figure along a metric ruler or metre stick.



   b. Use a strip of paper to help you find the perimeter of each figure. Then measure the strips of paper and find the sum.



Suggested Answers

1. The perimeter of figure A is 24.6 cm.

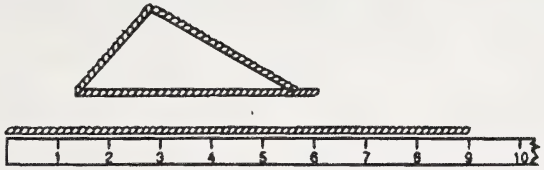
   The perimeter of figure B is 23.2 cm.

   The perimeter of figure D is 26.8 cm.

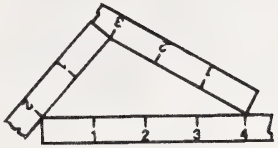
   The perimeter of figure F is 24.2 cm.

   Students answers will vary, depending on how carefully they measure each perimeter.

c. Use string to help you find the perimeter of each figure.
Then measure the string.

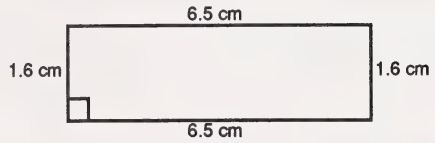


d. Measure each side of a figure and find the sum.

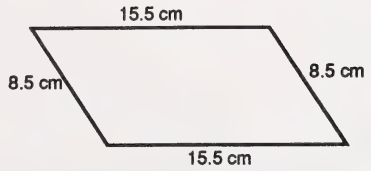


2. Find the perimeter of each of the following figures.

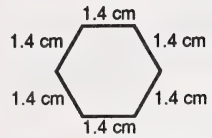
a.



b.



c.



2. a. $6.5 + 6.5 + 1.6 + 1.6 = 16.2$

The perimeter is 16.2 cm.

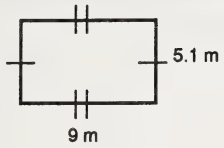
b. The perimeter is 48 cm.

c. The perimeter is 8.4 cm.

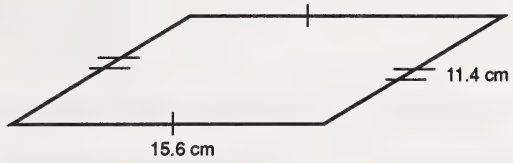
Practice Activities

1. Write a formula and then find the perimeter of each polygon.

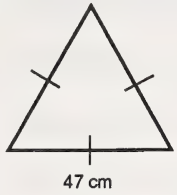
a.



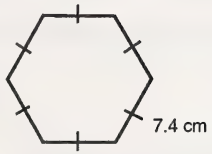
b.



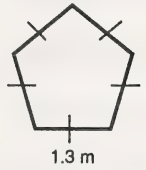
c.



d.



e.



Suggested Answers

1. a. $P = \ell + 2w$

$= 2 \times 9 + 2 \times 5.1$

$= 18 + 10.2$

$= 28.2$

The perimeter is 28.2 m.

b. $P = \ell + 2w$

$= 2 \times 15.6 + 2 \times 11.4$

$= 31.2 + 22.8$

$= 54$

The perimeter is 54 cm.

c. $P = 3s$

$= 3 \times 47$

$= 141$

The perimeter is 141 cm.

d. $P = 6s$

$= 6 \times 7.4$

$= 44.4$

The perimeter is 44.4 cm.

e. $P = 5s$

$= 5 \times 1.3$

$= 6.5$

The perimeter is 6.5 m.

2. Write a formula for the perimeter and find the perimeter of each of these polygons.

   a. a square with sides that are 9.2 m long

   b. a regular pentagon with sides that are 73 mm long

   c. a regular nonagon with sides that are 18 cm long

3. Use formulas to find the perimeters of the following polygons.

   a. a rectangle with dimensions of 0.4 m by 1600 mm

   b. a parallelogram with dimensions of 14 cm by 150 mm

   c. a rectangle with a length of 8.1 cm and a width of 45 mm

   d. a rectangle with a base of 14 mm and a height of 23 mm

   e. a rectangle with dimensions of 71 mm and 18 mm

2. a. $P = 4s$
   $= 4 \times 9.2$
   $= 36.8$
   The perimeter is 36.8 m.

   b. $P = 5s$
   $= 5 \times 73$
   $= 365$
   The perimeter is 365 mm.

   c. $P = 9s$
   $= 9 \times 18$
   $= 162$
   The perimeter is 162 cm.

3. a. $P = 2\ell + 2w$
   $= 2 \times 0.4 + 2 \times 1.6$
   $= 0.8 + 3.2$
   $= 4$
   The perimeter is 4 m.

   1600 mm = 1.6 m

   b. $P = 2\ell + 2w$
   $= 2 \times 14 + 2 \times 15$
   $= 28 + 30$
   $= 58$
   The perimeter is 58 cm.

   150 mm = 15 cm

   c. $P = 2\ell + 2w$
   $= 2 \times 8.1 + 2 \times 4.5$
   $= 16.2 + 9$
   $= 25.2$
   The perimeter is 25.2 cm.

   45 mm = 4.5 cm

   d. The perimeter is 74 mm.

   e. The perimter is 178 mm.

4. The Pentagon in Washington, D.C. is so named because of its shape. Each of its outer walls is 302 m long. Find the minimum distance (in kilometres) that you would travel while walking around the outside of the Pentagon.

4. a. $P = 5s$

$= 5 \times 0.302$

$= 1.51$

302 m = 0.302 km

The perimeter is 1.51 km.

Extra Practice

Complete the puzzle on the following page.[1]

First, figure out the perimeter of any polygon. Then find your answer in the coded line at the bottom of the page.

Second, each time the answer appears in the code, write the letter of that problem above it.

Keep working until you have decoded the line.

Suggested Answers

[1] Creative Publications for excerpt from *Mathimagination* ©1973, Sunnyvale, California 94086

CODE LINE	
U	Triangle with sides of 13 cm, 17 cm, and 24 cm
M	Square with side of 20 cm
T	Rectangle with sides of 29 cm and 36 cm
G	Equilateral triangle with side of 43 cm
O	Parallelogram with sides of 8 cm and 18 cm
E	Regular octagon with side of 14 cm
I	Quadrilateral with sides of 23 cm, 29 cm, 31 cm, and 44 cm
D	Regular pentagon with side of 15 cm
S	Isosceles triangle with base of 12 cm and side of 19 cm
H	Rhombus with side of 55 cm
P	Rectangle with sides of 7 cm and 16 cm
A	Regular hexagon with side of 6 cm
N	Pentagon with sides of 13 cm, 14 cm, 17 cm, 22 cm, and 27 cm
R	Parallelogram with sides of 48 cm and 66 cm

Title: Wet Threat

R	A	I	N	•	S	U	R	E	•	P	U	T	S	•	A
228 cm	36 cm	127 cm	93 cm		50 cm	54 cm	228 cm	112 cm		46 cm	54 cm	130 cm	50 cm		36 cm

D	A	M	P	E	R	•	O	N	•	T	H	I	N	G	S
75 cm	36 cm	80 cm	46 cm	112 cm	228 cm		52 cm	93 cm		130 cm	220 cm	127 cm	93 cm	129 cm	50 cm

Concluding Activities

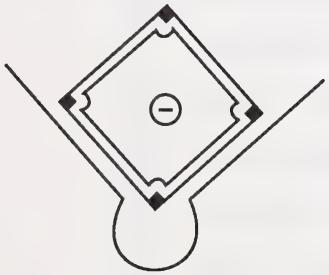
1. A window measures 124 cm by 92 cm.

   a. Find the length of the weather stripping needed to go around the window.

   b. The weather stripping is sold by the metre only. It costs 38¢/m. Find the cost of the weather stripping.

2. Each side of a stop sign is 28.2 cm long. Find the perimeter in metres.

3. The distance between each base on a ball diamond is 27.4 m. Find the approximate distance that a player travels to score a run.



Suggested Answers

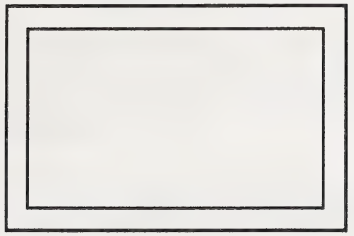
1. a. 432 cm of weather stripping is needed.

   b. The cost is $1.64.

2. The perimeter is 225.6 cm or 2.256 m.

3. The distance a runner travels is 109.6 m.

4. A rectangular pool is 25 m long and 15 m wide. It is surrounded by a cement deck that is 1.5 m wide.
   a. Find the perimeter of the pool.
   b. Find the outside perimeter of the deck.

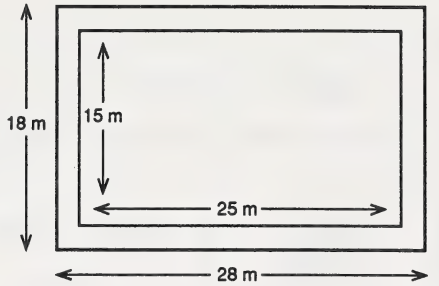


5. If fence posts are placed 2 m apart, how many are needed to fence a yard that is square with sides 16 m long?

6. Obtain a one dollar coin. The shape is classified as a hendecagon. It has eleven sides. First estimate its perimeter. Then measure its actual perimeter.

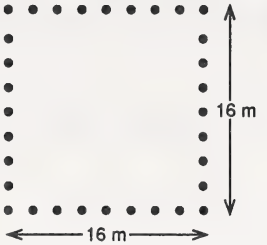
4. a. The perimeter of the pool is 80 m.

b.



The outside perimeter of the deck is 92 m.

5.



32 posts are needed.

6. Estimates will vary.

$P = 11 \times s$

$\doteq 11 \times 0.7$

$\doteq 7.7$

The side of a loonie is about 0.7 cm.

The perimeter is about 7.7 cm.

Note

The accuracy of the perimeter depends on how the side is measured.

7. Mr. Wilson is building the frames for seven windows for a new house that he is building. The dimensions of the windows are as follows:

Number of Windows	Dimensions
2	1.5 m by 2 m
3	1.2 m by 1.5 m
1	2.5 m by 2 m
1	1.8 m by 2 m

a. How many metres of lumber does he need? (You may disregard the width of the lumber.)

b. If the lumber comes in 3 m lengths, what is the minimum numer of pieces that Mr. Wilson needs?

7. a. The amount of lumber required is 46.8 m.

b. The minimum number of pieces needed is 16.

CIRCUMFERENCE

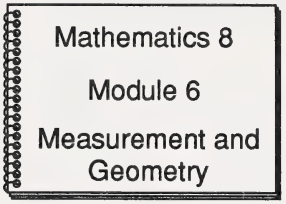
What Lies Ahead

In this section the student will learn these skills.

- knowing what π is and determining its value
- writing and using a formula that will indirectly measure the circumference of a circle

Gathering Materials

For this section the student needs these items.



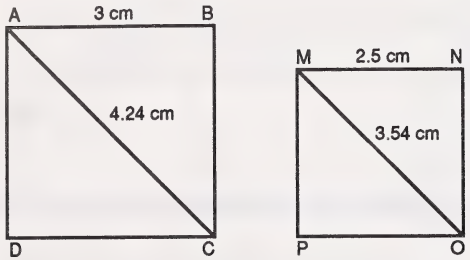
ruler

Guiding the Student

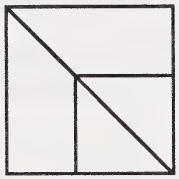
- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. All squares are similar figures. They all have the same shape.



If you stack the figures, their diagonals will line up.



a. Calculate the ratio of the measures of $\overline{AB}$ to $\overline{MN}$.

b. Calculate the ratio of the measures of $\overline{AC}$ to $\overline{MO}$. Round to nearest tenth.

c. Calculate the ratio of the perimeter of square ABCD to square MNOP.

d. What do you notice about the ratios of the corresponding parts?

Suggested Answers

1. a. $\frac{3}{2.5} = 1.2$

   b. $\frac{4.24}{3.54} = 1.2$

   c. $\frac{12}{10} = 1.2$

   d. They are all the same.

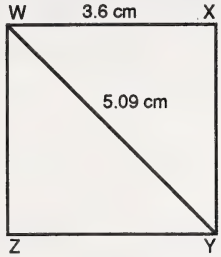
2. Use the squares in Question 1 to do the following questions.

   a. Calculate the ratio of the perimeter of square ABCD to the measure of its diagonal. Round to the nearest tenth.

   b. Calculate the ratio of the perimeter of square MNOP to the measure of its diagonal. Round to the nearest tenth.

   c. What do you notice about the ratio of the perimeter to the measure of the diagonal of these squares?

   d. What do you think will be the ratio of the perimeter to the diagonal of this square?



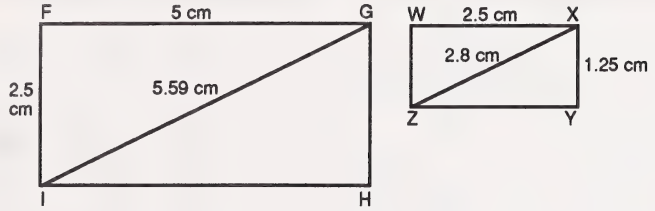
2. a. $\frac{12}{4.24} = 2.8$

   b. $\frac{10}{3.54} = 2.8$

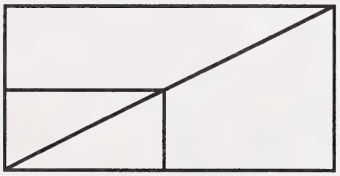
   c. The ratios are both 2.8.

   d. 2.8

3. Not all rectangles are similar. However, the following rectangles are similar figures.



If you stack the figures, their diagonals will line up.



a. Calculate the ratio of the perimeter of rectangle FGHI to the measure of its diagonal. Round to the nearest tenth.

b. Calculate the ratio of the perimeter of rectangle WXYZ to the measure of its diagonal. Round to the nearest tenth.

c. What do you notice about the ratios of these figures?

d. What do you think the ratio of perimeter to diagonal will be for other rectangles of this shape?

3. a. $\frac{15}{5.59} = 2.7$

b. $\frac{7.5}{2.8} = 2.7$

c. The are both 2.7.

d. 2.7

4. Measure the circumference and the diameter of four circular objects to the nearest tenth of a centimetre. Be as accurate as possible. Then calculate the ratio of the circumference to the diameter. Express the ratio as a decimal number. Display your data in the chart.

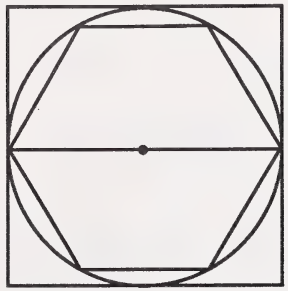
Object	Circum-ference (cm)	Diameter (cm)	Ratio of Circum-ference to Diameter

The ratio of the circumference of a circle to its diameter is about _____.

4. Answers will vary for the circumference and diameter of each object. However, the ratio of circumference to diameter will be about 3 for each object.

The ratio of the circumference of a circle to its diameter is about 3.

5. In the following diagram the diameter of the circle is 2 cm, the sides of the square are 2 cm, the sides of the hexagon are 1 cm.



a. Calculate the perimeter of the square.

b. Calculate the perimeter of the hexagon.

c. Estimate the perimeter of the circle.

5. a. $P = 4s$

$= 4 \times 2$

$= 8$

The perimeter of the square is 8 cm.

b. $P = 6s$

$= 6 \times 1$

$= 6$

The perimeter of the hexagon is 6 cm.

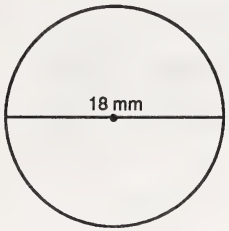
c. The perimeter of the circle should be between 6 and 8 cm.

Practice Activities

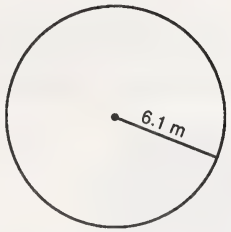
1. **Estimate** the circumference of each circle with the following measurements.
   a. diameter is 5 cm
   b. radius is 9.5 m
   c. diameter is 20 cm
   d. radius is 15 mm

2. Calculate the circumferences of these circles. Round your answers to the nearest tenth.

   a.



   b.



3. What is the circumference of a circular flower garden with a diameter of 4.2 m?

Suggested Answers

1. a. The circumference is about 15 cm.
   b. The circumference is about 30 cm.
   c. The circumference is about 60 cm.
   d. The circumference is about 45 cm.

2. a. $C = \pi d$
   $\doteq 3.14 \times 18$
   $\doteq 56.5$

   π is about 3.14.

   The circumference is about 56.5 mm.

   b. $C = \pi d$
   $\doteq 3.14 \times 12.2$
   $\doteq 38.3$

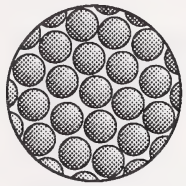
   $d = 2r$

   The circumference is about 38.3 m.

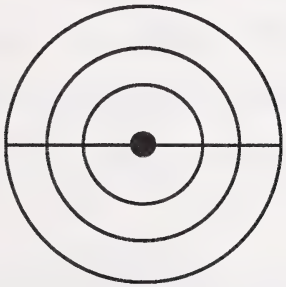
3. $C = \pi d$
   $\doteq 3.14 \times 4.2$
   $\doteq 13.2$

   The circumference of the circular flower garden is about 13.2 m.

4. A golf ball has a diameter of 42.7 mm. What is its circumference?



5. The diameters of the three larger rings on a sheet of curling ice are 3.66 m, 2.44 m, and 1.22 m. Calculate the circumference of each ring.



4. $C = \pi d$

$\doteq 3.14 \times 42.7$

$\doteq 134.1$

134.1 mm = 13.41 cm

The circumference of the ball is about 13.41 cm.

5. $C = \pi d$

$\doteq 3.14 \times 3.66$

$\doteq 11.49$

The circumference of the first ring is about 11.49 m.

$C = \pi d$

$\doteq 3.14 \times 2.44$

$\doteq 7.66$

The circumference of the second ring is about 7.66 m.

$C = \pi d$

$\doteq 3.14 \times 1.22$

$\doteq 3.83$

The circumference of the third ring is about 3.83 m.

Extra Practice

Complete the puzzle on the following page.[1]

Suggested Answers

See the following page for answers.

[1] Creative Publications for excerpt from *Mathimagination* ©1973, Sunnyvale, California 94086

FIND A MATCH

Each of the two blocks below is divided into 20 boxes. Boxes in the top block contain the diameter (*d*) or radius (*r*) of a circle. Figure out the circumference (*C*) of any of these circles, using $\pi = 3.14$. Then find your answer in the bottom block. Transfer the word from the top box into the bottom box.

Keep working and you will spell out a funny saying.

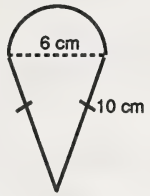
$d = 1$ m STILL	$d = 1$ cm OR	$d = 3$ m TO	$d = 8$ m LOT	$d = 10$ cm A
$d = 5$ cm THE	$d = 12$ m OF	$d = 1.4$ cm ARE	$d = 9$ cm A	$d = 4.9$ cm NOT
$r = 1$ m WAS	$r = 3$ m FAMOUS	$r = 8$ cm WHETHER	$r = 10$ cm DECIDE	$r = 5$ m SCIENTISTS
$r = 50$ cm CRACK	$r = 1.5$ cm TRYING	$r = 3.3$ m ATOM	$r = 2.5$ m WISE	$r = 5.3$ m SPLITTING

$C = 28.26$ cm A	$C = 25.12$ m LOT	$C = 37.68$ m OF	$C = 18.84$ m FAMOUS	$C = 31.4$ m SCIENTISTS
$C = 4.396$ cm ARE	$C = 3.14$ m STILL	$C = 9.42$ cm TRYING	$C = 9.42$ m TO	$C = 62.8$ cm DECIDE
$C = 50.24$ cm WHETHER	$C = 3.14$ cm OR	$C = 15.386$ cm NOT	$C = 33.284$ m SPLITTING	$C = 15.7$ cm THE
$C = 20.724$ m ATOM	$C = 6.28$ m WAS	$C = 31.4$ cm A	$C = 15.7$ m WISE	$C = 314$ cm CRACK

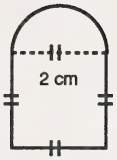
Concluding Activities

1. Find the perimeter of each figure. Round to the nearest tenth.

a.



b.



c.

Suggested Answers

1. a. $C = \pi d$
$\doteq 3.14 \times 6$
$\doteq 18.8$

The circumference of the arc is half the circumference of the circle.

So, $0.5 \times 18.8 = 9.4$.

The circumference of the arc is about 9.4 cm.

$P \doteq 9.4 + 10 + 10$
$\doteq 29.4$

The total perimeter of the figure is 29.4 cm.

b. $C = \pi d$
$\doteq 3.14 \times 2$
$\doteq 6.3$

The circumference of the arc is half the circumference of the circle.

So, $0.5 \times 6.3 \doteq 3.2$.

The circumference of the arc is about 3.2 cm.

$P \doteq 3.2 + 2 + 2 + 2$
$\doteq 9.2$

The total perimeter is about 9.2 cm.

c. $C = \pi d$
$\doteq 3.14 \times 14$
$\doteq 44.0$

$d = 2r$

So, $0.25 \times 44.0 \doteq 11$.

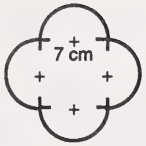
The arc is one fourth of a circle.

The circumference of the arc is about 11 mm.

$P \doteq 11 + 7 + 7$
$\doteq 25$

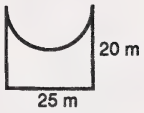
The total perimeter is about 25 mm.

d.

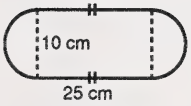


+ indicates the centre of a circle.

e.



f.



d. $C = \pi d$
$\doteq 3.14 \times 7$
$\doteq 22$

The circumference of the arc is half the circumference of the circle.

and $0.5 \times 22 \doteq 11$

The circumference of each arc is about 11 cm.

$P \doteq 4 \times 11$
$\doteq 44$

The perimeter is made of 4 arcs.

The total perimeter is about 44 cm.

e. $C = \pi d$
$\doteq 3.14 \times 25$
$\doteq 77.5$

The circumference of the arc is half the circumference of the circle.

$0.5 \times 77.5 \doteq 38.8$

The circumference of the arc is about 38.8 m.

$P \doteq 38.8 + 20 + 20 + 25$
$\doteq 103.8$

The total perimeter is about 103.8 m.

f. $C = \pi d$
$\doteq 3.14 \times 10$
$\doteq 31.4$

The circumference of the two arcs is about 31.4 cm.

$P \doteq 31.4 + 25 + 25$
$\doteq 81.4$

The total perimeter is about 81.4 cm.

2. The diameter of the earth at the equator is approximately 12 750 km.

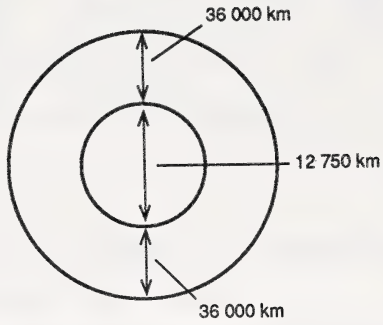
   a. The circumference of the earth is about how many kilometres?

   b. If a satellite is orbiting the earth 36 000 km above the earth's surface, how far does it travel in completing one orbit?

2. a. The circumference of the earth is about 40 035 km.

   b. The diameter of the circular orbit is 84 750 km.

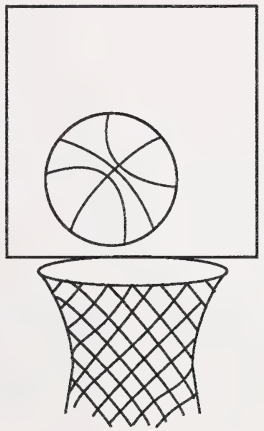
   The satellite travels about 266 115 km.



3. The diameter of a basketball is 24.5 cm. The diameter of a basketball hoop is 45 cm. (You may wish to draw a diagram to help you answer the questions.)

   a. The circumference of the hoop is how much larger than the circumference of the basketball?

   b. If the ball goes through the center of the hoop, find the distance between the ball and the hoop.



3. a. $C = \pi d$
$\doteq 3.14 \times 45$
$\doteq 141.3$

The circumference of the basketball hoop is about 141.3 cm.

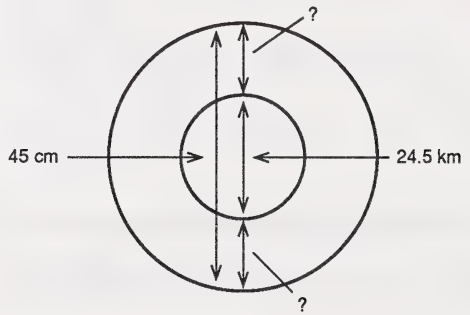
$C = \pi d$
$\doteq 3.14 \times 24.5$
$\doteq 76.9$

The circumference of the basketball is about 76.9 cm.

$141.3 - 76.9 = 64.4$

The circumference of the hoop is about 64.4 cm larger.

b.



$45 - 24.5 = 20.5,$

and $0.5 \times 20.5 = 10.25.$

The distance between the ball and the hoop is 10.25 cm.

AREA OF RECTANGLES AND SQUARES

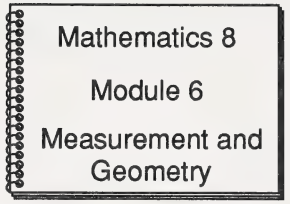
What Lies Ahead

In this section the student will learn this skill.

- using a formula to determine the area of a rectangle

Gathering Materials

For this section the student needs these items.

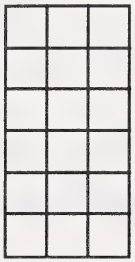


Guiding the Student

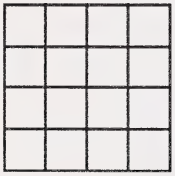
- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Find the area of each rectangle.

   a. 

   b.

   c. 

2. a. Did you count squares to find the area?

   b. Is there an easier way?

Suggested Answers

1. a. 18 square units

   b. 20 square units

   c. 16 square units

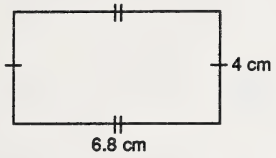
2. a. Answers will vary.

   b. The easiest way to calculate the area of these rectangles is to count the number of squares in a row and the number of rows. Then multiply these two numbers together.

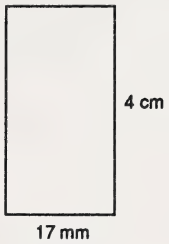
Practice Activities

1. Use the formula to find the area of each rectangle.

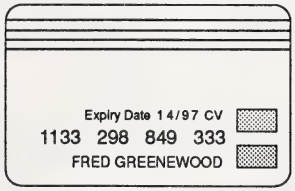
a.



b.



2. A credit card measures 8.5 cm by 5.4 cm. Find its area.



Suggested Answers

1. a. $A = b \times h$
$= 6.8 \times 4$
$= 27.2$

The area is $27.2\ cm^2$.

b. $A = b \times h$
$= 1.7 \times 4$ 17 mm = 1.7 cm
$= 6.8$

The area is $6.8\ cm^2$.

2. $A = b \times h$
$= 8.5 \times 5.4$
$= 45.9$

The area is $45.9\ cm^2$.

Extra Practice

Complete the puzzle on the following page.[1]

Figure out the area of each rectangle. Then write the letter inside each rectangle into a box at the bottom of the page. The letter of the smallest rectangle goes in the first box, the letter of the next smallest rectangle goes in the second box, and so on up to the largest rectangle.

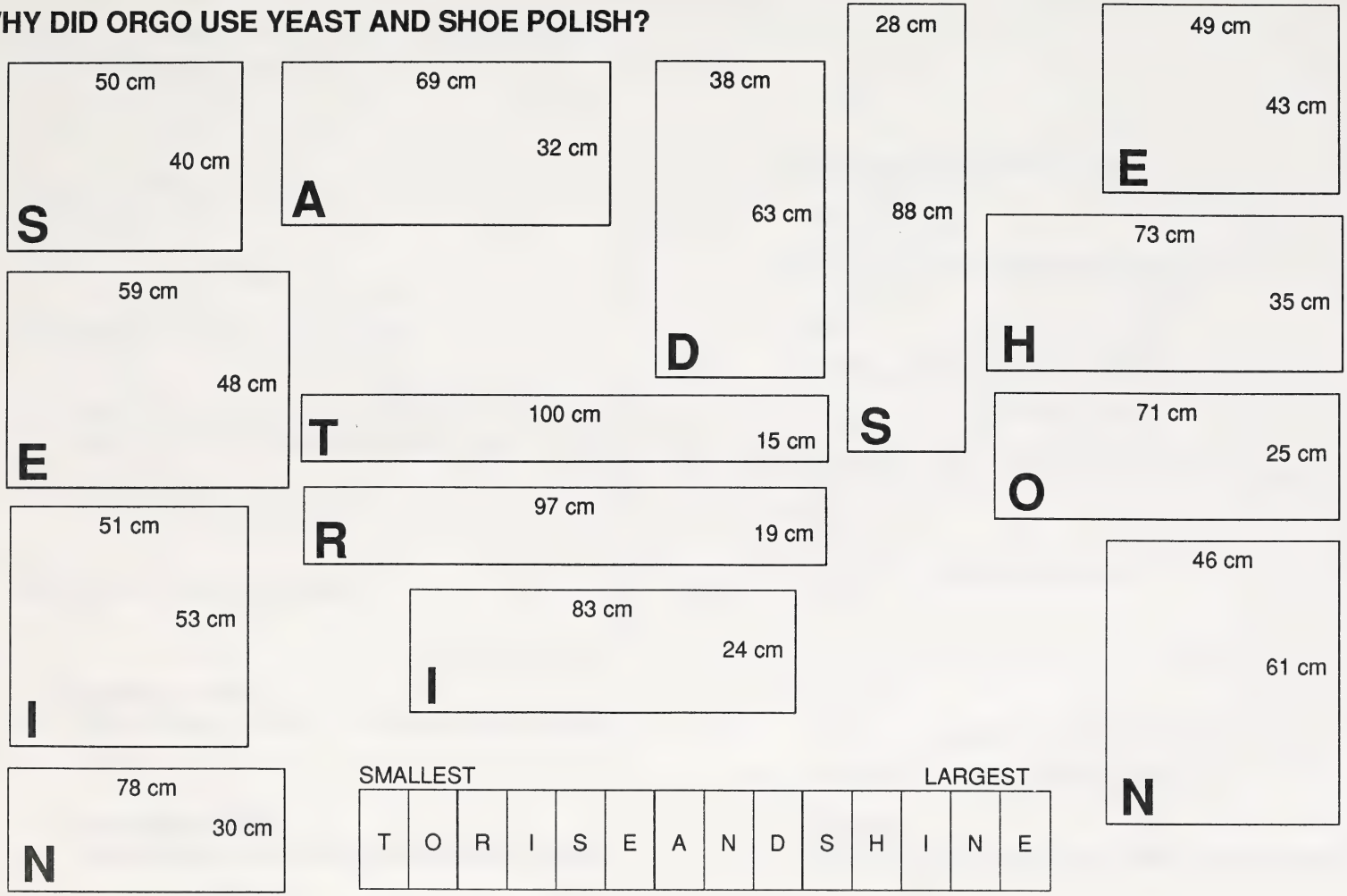
Write the letters in proper order and you will have the answer to the question.

Suggested Answers

See the following page for answers.

[1] Creative Publications for excerpt from *Mathimagination* ©1973, Sunnyvale, California 94086

WHY DID ORGO USE YEAST AND SHOE POLISH?



SMALLEST LARGEST

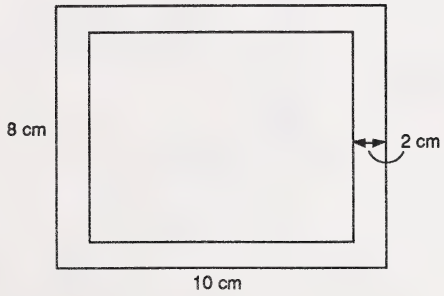
T	O	R	I	S	E	A	N	D	S	H	I	N	E

Concluding Activities

1. a. What happens to the area of a rectangle when its sides are doubled in length?

   b. What happens to the area of a rectangle when its sides are tripled in length?

2. Find the area of this picture frame.



Suggested Answers

1. a. The area of the new rectangle is quadruple the area of the original.

   b. Its area is nine times the original area.

2. $A = b \times h$
   $= 10 \times 8$
   $= 80$

   The area of the larger rectangle is 80 cm^2.

   $A = b \times h$
   $= 6 \times 4$
   $= 24$

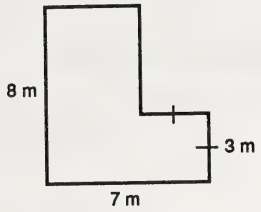
   $10 - 4 = 6$
   $8 - 4 = 4$

   The area of the smaller rectangle is 24 cm^2.

   $80 - 24 = 56$

   The area of the picture frame is 56 cm^2.

3. Mrs. Ben Zui is carpeting her living room and dining room. The cost of carpeting is $\$34.24/m^2$.



a. Find the amount of carpet needed.

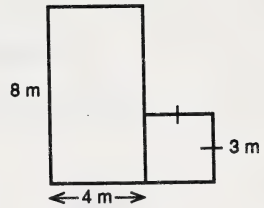
b. Calculate the cost of carpeting the two rooms.

3. a. $A = b \times h$

$= 4 \times 8$

$= 32$

The area of the living room is $32\ m^2$.



$A = b \times h$

$= 3 \times 3$

$= 9$

The area of the dining room is $9\ m^2$.

$32 + 9 = 41$

The total area of the living room and the dining room is $41\ m^2$.

So, $41\ m^2$ of carpeting is required.

b. $41 \times 34.24 = 1403.84$

The cost of carpeting the rooms is $1403.84.

AREA OF PARALLELOGRAMS

What Lies Ahead

In this section the student will use a formula to determine the area of a parallelogram.

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 6

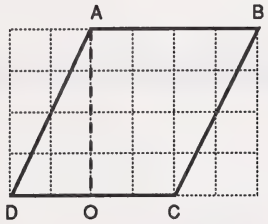
Measurement and Geometry

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Draw figure ABCD on a sheet of grid paper from the Appendix. Cut off the triangular portion AOD and slide it across the figure so $\overline{AD}$ fits on $\overline{BC}$. Then find the area of figure ABCD.

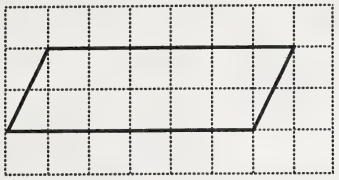


Suggested Answers

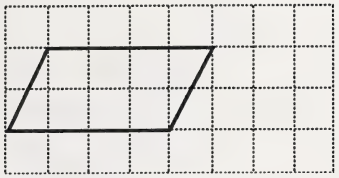
1. The area of figure ABCD is 16 square units.

2. Use the method that you discovered in Question 1 to find the areas of the following figures.

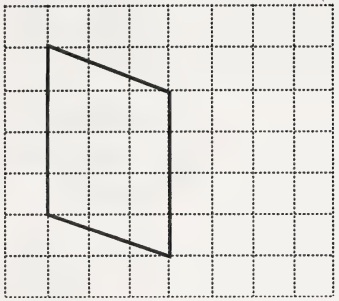
a.



b.



c.



2. a. The area is 12 square units.

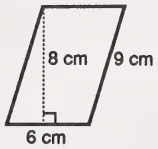
b. The area is 8 square units.

c. The area is 12 square units.

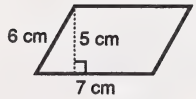
Practice Activities

1. What is the length of the base and the height of each parallelogram?

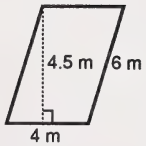
   a.



   b.



   c.



2. Use the formula to find the area of each parallelogram in Question 1.

Suggested Answers

1. a. $b = 6$ cm
   $h = 8$ cm

   b. $b = 7$ cm
   $h = 5$ cm

   c. $b = 4$ m
   $h = 4.5$ m

2. a. 48 cm^2
   b. 35 cm^2
   c. 18 cm^2

3. Complete the chart for parallelograms.

	Base	Height	Area in Smaller Units	Area in Larger Units
a.	25 cm	80 mm		
b.	800 cm	5 m		
c.	4.2 cm	32 mm		
d.	0.2 km	800 m		

3.

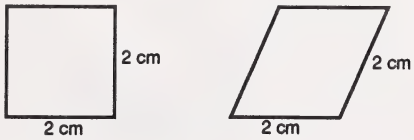
	Base	Height	Area in Smaller Units	Area in Larger Units
a.	25 cm	80 mm	20 000 mm^2	200 cm^2
b.	800 cm	5 m	4000 cm^2	40 m^2
c.	4.2 cm	32 mm	1344 mm^2	13.44 cm^2
d.	0.2 km	800 m	160 000 mm^2	0.16 km^2

Concluding Activities

1. The base of a parallelogram is 10 cm. The height is 2 cm more than half the base. Find the area of the parallelogram.

2. The height of a parallelogram is 4.5 cm. The base is twice the height. What is the area of the parallelogram?

3. Below are a square and a rhombus.



   a. What is the area of the square?

   b. Is the area of the rhombus greater than, less than, or equal to the area of the square? Give a reason for your answer.

Suggested Answers

1. $\frac{1}{2} \times 10 + 2 = 7$

   The height is 7 cm.

   $A = bh$
   $= 10 \times 7$
   $= 70$

   The area is 70 cm^2.

2. $2 \times 4.5 = 9$

   The base is 9 cm.

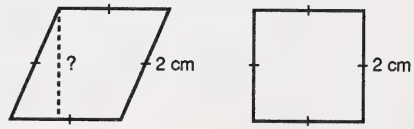
   $A = b \times h$
   $= 9 \times 4.5$
   $= 40.5$

   The area is 40.5 cm^2.

3. a. $A = bh$
   $= 2 \times 2$
   $= 4$

   The area of the square is 4 cm^2.

   b.



   The height is less than 2 cm.

   So, the area of the rhombus will be less than the area of the square.

AREA OF TRIANGLES

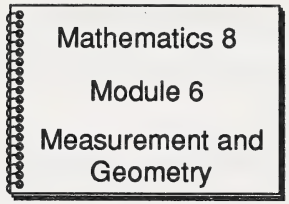
What Lies Ahead

In this section the student will learn these skills.

- using a formula to determine the area of triangles

Gathering Materials

For this section the student needs these items.



scissors

(optional)

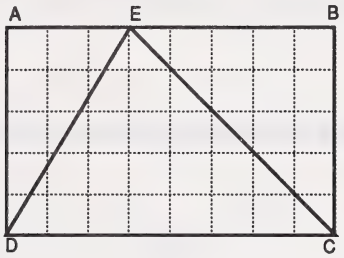
Lesson Series E in *Geometric Concepts/Area*

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Draw rectangle ABCD on a sheet of grid paper from the Appendix. Cut out the rectangle and then cut out triangle CDE as illustrated.



Now arrange the two smaller triangles, triangle AED and triangle EBC, to fit exactly inside triangle CDE. You may have to turn or flip the pieces to make them fit.

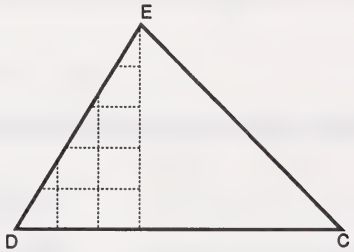
a. How is the area of triangle CDE related to the area of rectangle ABCD?

b. Calculate the area of the rectangle.

c. Use the relationship you discovered in part a. to find the area of triangle CDE.

Suggested Answers

1. When the pieces are cut out, the two triangles fit exactly into triangle CDE.

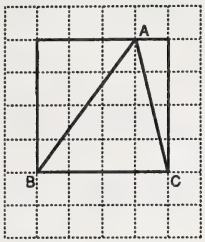


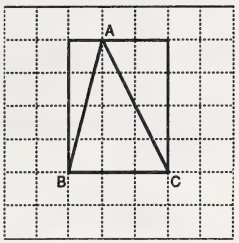
a. The area of triangle CDE is half the area of rectangle ABCD.

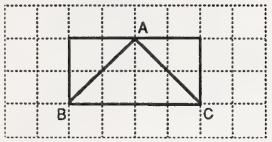
b. The area of the rectangle is 40 square units.

c. The area of triangle CDE is 20 square units

2. Use the method you found in Question 1 to find the area of triangle ABC in each of the following.

a. 

b. 

c. 

2. The cut-out and rearranged pieces are not shown here, but students should do this step.

a. The area of trangle ABC is half the area of the rectangle. So, its area is 8 square units.

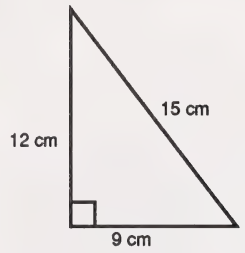
b. The area of triangle ABC is half the area of the rectangle. So, its area is 6 square units.

c. The area of triangle ABC is half the area of the rectangle. So, its area is 4 square units.

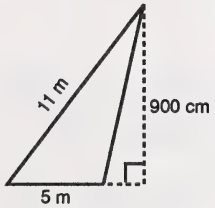
Practice Activities

1. Use a formula to calculate the area of each triangle.

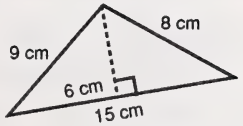
a.



b.



c.



Suggested Answers

1. a. $A = \frac{b \times h}{2}$

$= \frac{9 \times 12}{2}$

$= 54$

The area is 54 cm^2.

b. $A = \frac{b \times h}{2}$

$= \frac{5 \times 11}{2}$

$= 27.5$

The area is 27.5 m^2.

c. $A = \frac{b \times h}{2}$

$= \frac{15 \times 6}{2}$

$= 45$

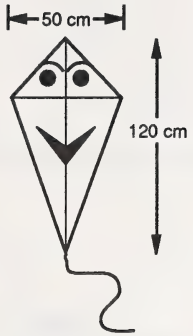
The area is 45 cm^2.

2. Complete the chart for triangles.

	Base	Height	Area
a.	15 m	6 m	
b.	3.4 cm	5 cm	
c.	9 m	900 cm	
d.	40 mm	5 cm	
e.	4 cm	6 cm	

Note the different units.

3. Calculate the area of the kite shown.



2.

	Base	Height	Area
a.	15 m	6 m	$45\ m^2$
b.	3.4 cm	5 cm	$8.5\ cm^2$
c.	9 m 900 cm	9 m 900 cm	$40.5\ m^2$ $405\ 000\ cm^2$
d.	40 mm 4 cm	50 mm 5 cm	$1000\ mm^2$ $10\ cm^2$
e.	4 cm	6 cm	$12\ cm^2$

3. $A = \frac{b \times h}{2}$

$= \frac{120 \times 25}{2}$

$= 1500$

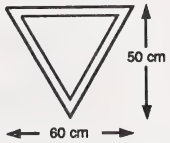
Each triangle has an area of $1500\ cm^2$.

The area of the kite is $3000\ cm^2$.

There are two congruent triangles.

4. How much felt is needed to make 30 pennants?

5. Calculate the area of the traffic sign.



Computer Alternative

6. Do Lesson Series E in *Geometric Concepts/Area*.

4. $A = \frac{b \times h}{2}$

$= \frac{15 \times 60}{2}$

$= 450$

150 mm = 15 cm

The area of one pennant is 450 cm^2.

The area of 30 pennants is 13 500 cm^2 or 1.35 m^2.

5. $A = \frac{b \times h}{2}$

$= \frac{60 \times 50}{2}$

$= 1500$

The area is 1500 cm^2.

6. Computer corrected

Extra Practice

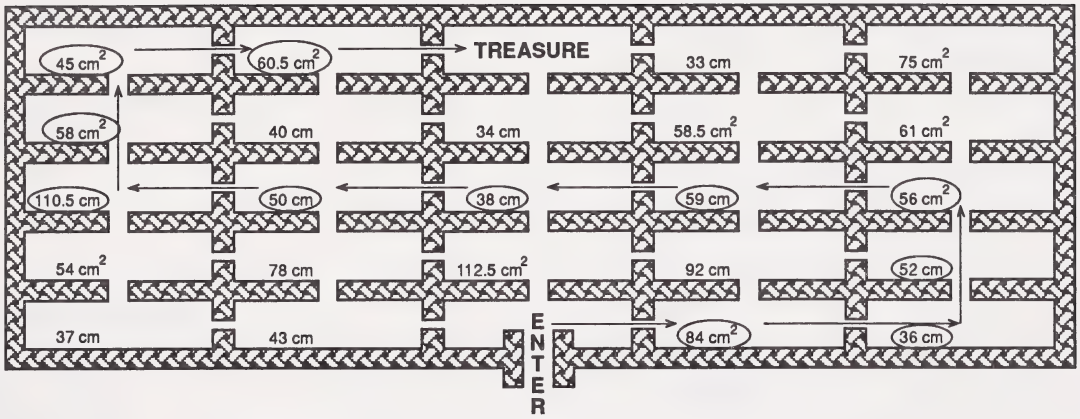
Do the puzzle on the following page.[1]

Suggested Answers

See the following pages for answers.

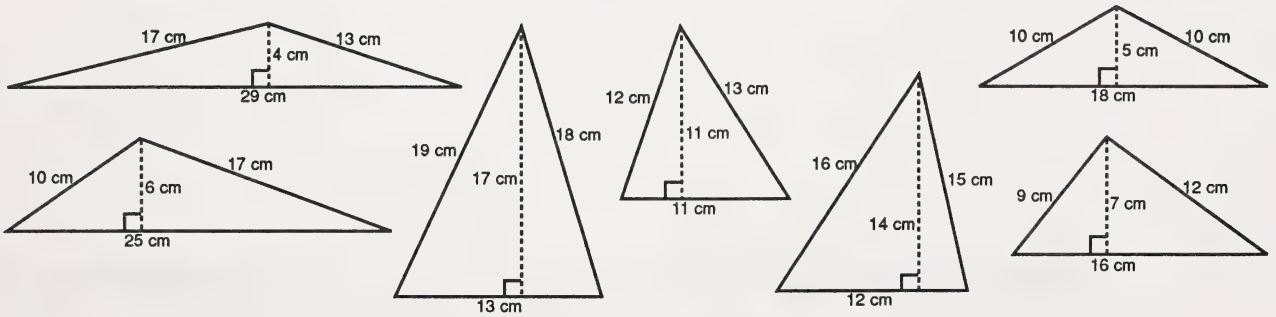
[1] Creative Publications for excerpt from *Mathimagination* ©1973, Sunnyvale, California 94086

Maze Daze



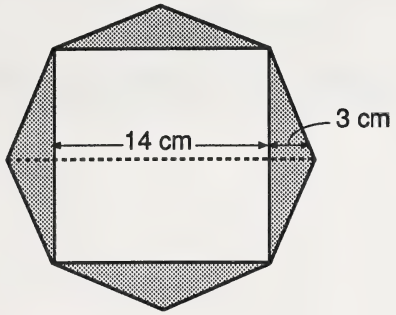
Each room in this maze contains a measurement. Fourteen of these measurements are the areas and perimeters of the seven triangles below. Figure out the area and perimeter of any triangle and find the answers in the maze. Circle the answers.

Keep working until you can draw a path to the treasure room that goes only through rooms containing correct answers. (It might not go through all of the correct answers.)

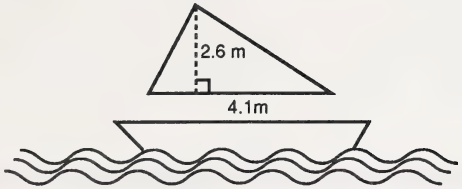


Concluding Activities

1. Find the area of the shaded part of the regular octagon.



2. Calculate the area of the sail.



3. Mr. Rawlins has a flower bed shaped like an isosceles right triangle in the corner of his lot. Find the area if the sides measure 2.4 m, 2.4 m, and 3.4 m.

1. Each of the four triangles has the same area.

$$A = \frac{b \times h}{2}$$
$$= \frac{14 \times 3}{2}$$
$$= 21$$

Each triangle has an area of 21 cm^2.

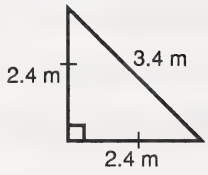
The shaded part has an area of 84 cm^2.

2. $$A = \frac{b \times h}{2}$$
$$= \frac{4.1 \times 2.6}{2}$$
$$= 5.33$$

The area of the sail is 5.33 m^2.

3. $$A = \frac{b \times h}{2}$$
$$= \frac{3.4 \times 2.4}{2}$$
$$= 8.16$$

The area is about 8.2 m^2.



4. What happens to the area of a triangle under the following conditions?

   a. the height is doubled

   b. the base is doubled

   c. both the base and the height are doubled

   d. both the base and the height are tripled

4. a. The area of the triangle is double the original area.

   b. The area of the triangle is double the original area.

   c. The area of the triangle is quadruple the original area.

   d. The area of the triangle is nine times the original area.

AREA OF TRAPEZOIDS

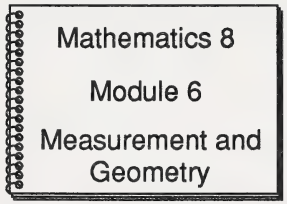
What Lies Ahead

In this section the student will learn this skill.

- using a formula to determine the area of a trapezoid

Gathering Materials

For this section the student needs these items.



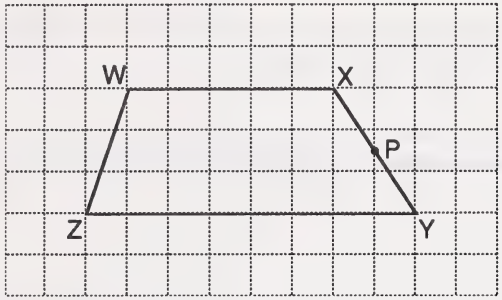
scissors

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Draw the following trapezoid on a piece of grid paper and then find the half turn image about point P.



a. What does the combination of the two figures (original trapezoid and image) look like?

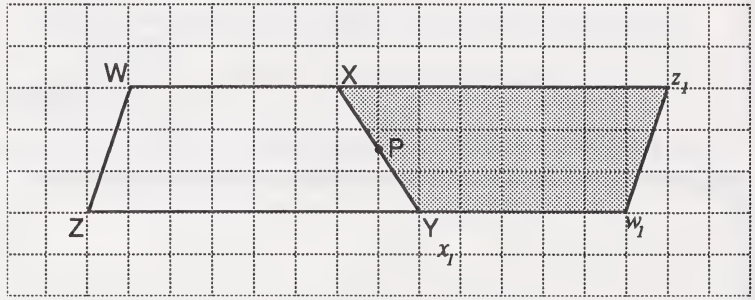
b. How do you find the area of this shape?

c. How is the area of the trapezoid related to this shape?

d. Use the relationship you discovered in part c. to find the area of the trapezoid.

Suggested Answers

1. This shows the trapezoid and its half-turn image.



a. The two figures look like a parallelogram.

b. You can find the area of a parallelogram by using this formula:

$$A = b \times h$$
$$= 13 \times 3$$
$$= 39$$

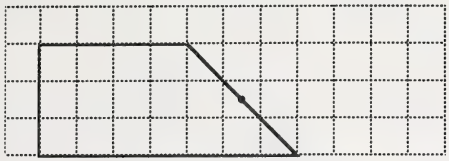
The area of the parallelogram is 39 square units.

c. The area of the trapezoid is half the area of the parallelogram formed.

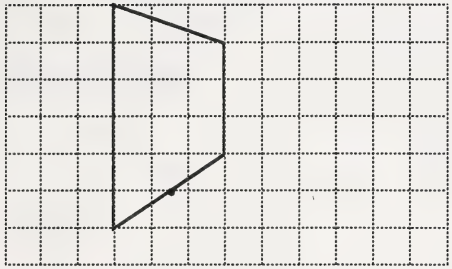
d. The area of the trapezoid is 0.5×39 or 19.5 square units.

2. Use the method you discovered in Question 1 to find the area of these trapezoids.

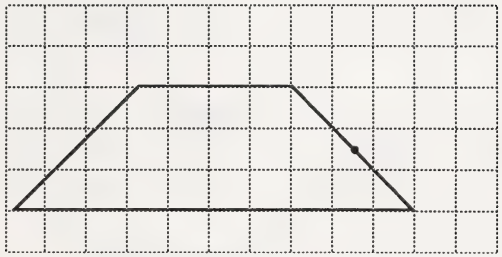
a.



b.



c.



2. The parallelograms that are formed by combining the trapezoids and their half-turn images are not shown, but students should do this step for each.

a. The area of the parallelogram formed is 33 square units.

The area of the trapezoid is 16.5 square units.

b. The area of the parallelogram formed is 27 square units.

The area of the trapezoid is 13.5 square units.

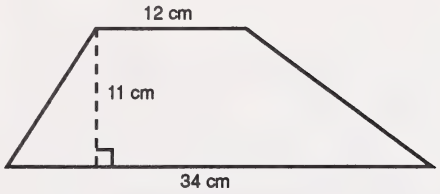
c. The area of the parallelogram formed is 42 square units.

The area of the trapezoid is 21 square units.

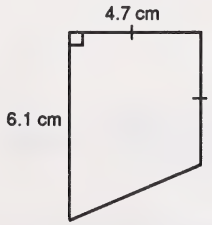
Practice Activities

1. Use the formula to find the areas of these trapezoids.

   a.



   b.



2. Find the area of the sign.

Suggested Answers

1. a. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{11(34 + 12)}{2}$

$= \frac{11 \times 46}{2}$

$= 253$

The area is 253 cm^2.

b. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{4.7(6.1 + 4.7)}{2}$

$\doteq 25.4$

The area is 25.4 cm^2.

2. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{25(46 + 64)}{2}$

$= 1375$

The area is 1375 cm^2.

3. Complete the chart for trapezoids.

	Height	$Base_1$	$Base_2$	Area
a.	6 cm	12 cm	10 cm	
b.	5.4 m	3.8 m	7.2 m	
c.	22 mm	3 cm	3.2 cm	
d.	5 m	4 m	6 m	

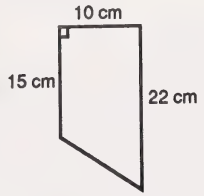
3.

	Height	$Base_1$	$Base_2$	Area
a.	6 cm	12 cm	10 cm	66 cm^2
b.	5.4 m	3.8 m	7.2 m	29.7 m^2
c.	2.2 cm 22 mm	3 cm 30 mm	3.2 cm 32 mm	6.8 cm^2 682 mm^2
d.	5 m	4 m	6 m	25 m^2

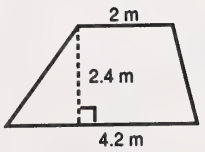
Extra Practice

Use a formula to find the area of each trapezoid.

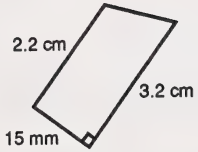
1.



2.



3.



Suggested Answers

1. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{10(15 + 22)}{2}$

$= \frac{10 \times 37}{2}$

$= 185$

The area is 185 cm^2.

2. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{2.4(4.2 + 2)}{2}$

$= \frac{2.4 \times 6.2}{2}$

$= 7.44$

The area is about 7.4 m^2.

3. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{1.5(2.2 + 3.2)}{2}$

$= \frac{1.5 \times 5.4}{2}$

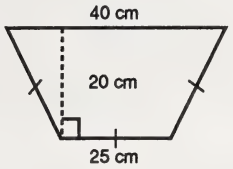
$= 4.05$

15mm = 1.5cm

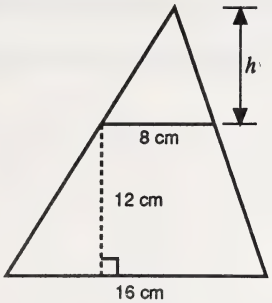
The area is about 4.1 cm^2.

Concluding Activities

1. Mr. Williams has a flower pot that looks like a trapezoid from one end. Find the area of the end of the flower pot.



2. a. The top of a triangle was cut off. Find the area of the part that remains.



b. If the area of the original triangle was 180 cm^2, find the height (h) of the triangle that was cut off.

Suggested Answers

1. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{20(25 + 40)}{2}$

$= \frac{20 \times 65}{2}$

$= 130$

The area of the end of the flower pot is 130 cm^2.

2. a. The pot that remains is a trapezoid.

$A = \frac{h(b_1 + b_2)}{2}$

$= \frac{12(16 + 8)}{2}$

$= \frac{12 \times 24}{2}$

$= 144$

The area of the trapezoid is 144 cm^2.

b. The area of the triangle that was cut off is 180 – 144 or 36 cm^2.

$A = \frac{b \times h}{2}$

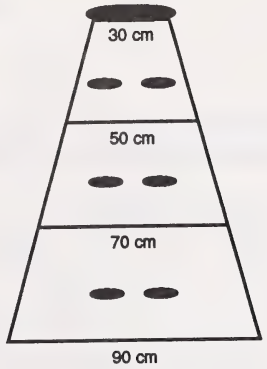
$36 = \frac{8 \times h}{2}$

$h = 9$

$\frac{8 \times 9}{2} = 36$

The height is 9 cm.

3. The side of a vaulting horse for gymnastics is shaped like a trapezoid. It is made up of three sections that lock together. Each section is 40 cm high.



a. Find the area of each section.

b. What is the total area of the side of the vaulting horse?

3. a. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{40(30 + 50)}{2}$

$= \frac{40 \times 80}{2}$

$= 1600$

The area of the top section is 1600 cm^2.

$A = \frac{h(b_1 + b_2)}{2}$

$= \frac{40(50 + 70)}{2}$

$= \frac{40 \times 120}{2}$

$= 2400$

The area of the middle section is 2400 cm^2.

$A = \frac{h(b_1 + b_2)}{2}$

$= \frac{40(70 + 90)}{2}$

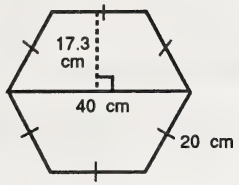
$= \frac{40 \times 160}{2}$

$= 3200$

The area of the bottom section is 3200 cm^2.

b. The total area is 7200 cm^2

4. Find the area of this hexagon.



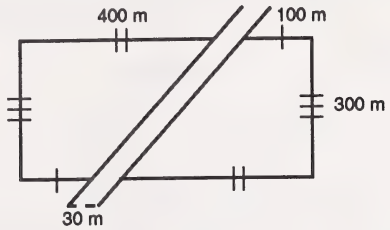
4. The hexagon is made of two trapezoids.

$$A = \frac{h(b_1 + b_2)}{2}$$
$$= \frac{17.3 \times (40 + 20)}{2}$$
$$= \frac{17.3 \times 60}{2}$$
$$= 519$$

The area of each trapezoid is 519 cm^2.

So, the area of the hexagon is 2×519 or 1038 cm^2.

5. A highway was built through Mr. Ingram's farm, dividing one of his fields as illustrated.



a. Find the area of one of the resulting fields (they're both the same).

b. What was the area of the original field?

c. How much land did he lose to the highway?

5. a. $A = \frac{h(b_1 + b_2)}{2}$

$= \frac{300 \times (100 + 400)}{2}$

$= \frac{300 \times 500}{2}$

$= 75\ 000$

Each field has an area of 75 000 m^2.

b. $A = bh$

$= 530 \times 300$

$= 159\ 000$

The original field had an area of 159 000 m^2.

c. $159\ 000 - 2 \times 75\ 000$

$= 159\ 000 - 150\ 000$

$= 9000$

Mr. Ingram lost 9000 m^2 to the highway.

AREA OF CIRCLES

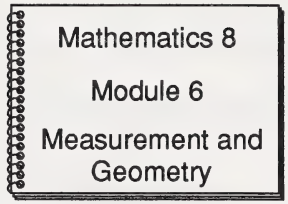
What Lies Ahead

In this section the student will learn this skill.

- using a formula to determine the area of a circle

Gathering Materials

For this section the student needs these items.



scissors

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. In the following diagram the diameter of the circle is 2 cm, the sides of the larger square are 2 cm, and the sides of the smaller square are 1.4 cm.

a. Calculate the area of the larger square.

b. Calculate the area of the smaller square.

c. Estimate the area of the circle.

Suggested Answers

1. a. $A = b \times h$
$= 2 \times 2$
$= 4$

The area of the larger square is 4 cm^2.

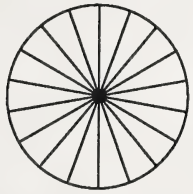
b. $A = b \times h$
$= 1.4 \times 1.4$
$= 1.96$

The area of the smaller square is about 2 cm^2.

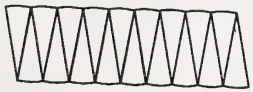
c. The area of the circle is between 2 cm^2 and 4 cm^2.

2. Use your compass to draw a large circle. The radius should be at least 8 cm.

   Use your protractor to divide the circle into 18 equal parts of 20°. Colour the bottom half of the circle.



   Now cut out the parts and reassemble them like this.



   a. Calculate the area of the parallelogram formed.

   b. How are the parts of the parallelogram and circle related?

   c. What is the area of the circle?

2. a. Measure the parallelogram and use the formula $A = b \times h$.

      Answers will vary, depending on the size of the circle.

   b. The height of the parallelogram is equal to the radius of the circle.

      The base of the parallelogram is half the circumference of the circle.

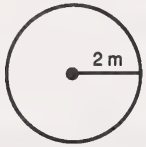
   c. The circle will have the same area as the parallelogram.

      Answers will vary, depending on the size of the circle.

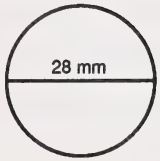
Practice Activities

1. Use a formula to calculate the area of the following circles to the nearest tenth.

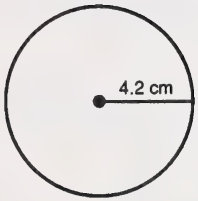
a.



b.



c.



Suggested Answers

1. a. $A = \pi r^2$
$\doteq 3.14 \times 2^2$
$\doteq 3.14 \times 4$
$\doteq 12.6$

The area is about 12.6 m^2.

b. $A = \pi r^2$
$\doteq 3.14 \times 14^2$
$\doteq 3.14 \times 196$
$\doteq 615.4$

$r = \frac{1}{2}d$

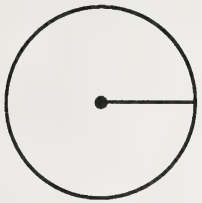
The area is about 615.4 mm^2.

c. $A = \pi r^2$
$\doteq 3.14 \times 4.2^2$
$\doteq 3.14 \times 17.64$
$\doteq 55.4$

The area is about 55.4 cm^2.

2. Measure the radius of the circles in millimetres. Use the formula to calculate the areas to the nearest tenth.

a.



b.

3. A circular table has a diameter of 1.4 m. Find the area of the table top to the nearest tenth.

4. How much greater is the area of a quarter than the area of a dime?

2. a. $r = 15$ mm

$$A = \pi r^2$$
$$\doteq 3.14 \times 15^2$$
$$\doteq 706.9 \text{ mm}^2.$$

b. $r = 9$ mm

$$A = \pi r^2$$
$$\doteq 3.14 \times 9^2$$
$$\doteq 254.5 \text{ mm}^2.$$

3. $$A = \pi r^2$$
$$\doteq 3.14 \times 0.7^2$$
$$\doteq 1.5 \text{ m}^2$$

4. A quarter has a diameter of 2.3 cm and a dime has a diameter of 1.8 cm.

$$A = \pi r^2$$
$$\doteq 3.14 \times (1.15)^2$$
$$\doteq 4.2$$

$$A = \pi r^2$$
$$\doteq 3.14 \times (0.9)^2$$
$$\doteq 2.5$$

$4.2 - 2.5 = 1.7$

The area of the quarter is 1.7 cm^2 greater.

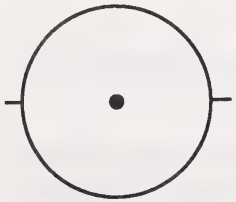
5. Estimate the areas of the circles which have the following radii.

   a. 10 cm

   b. 6 cm

   c. 20 m

6. A face-off circle has a radius of 4.5 m. Find its area.



7. A lawn sprinkler sprays water a distance of 3.2 m in all directions. Find the area of grass that will be watered.

5. Estimates will vary. The exact answers are given.

   a. $314\ cm^2$

   b. $113\ cm^2$

   c. $1256\ m^2$

6. $63.6\ m^2$

7. $A = \pi r^2$

   $\doteq 3.14 \times (3.2)^2$

   $\doteq 32.2$

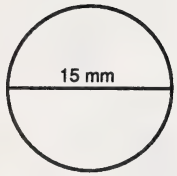
   The area watered is about $32.2\ m^2$.

Extra Practice

Use the formula to calculate the area of each circle to the nearest tenth.

1.

2.



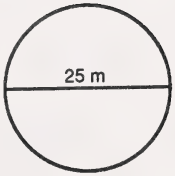
Suggested Answers

1. $120.7\ m^2$

2. $176.6\ mm^2$

3.

4.



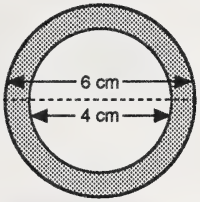
3. $530.7\ cm^2$

4. $490.6\ m^2$

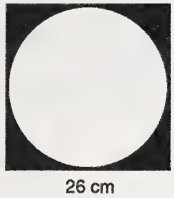
Concluding Activities

1. Calculate the areas of the shaded regions.

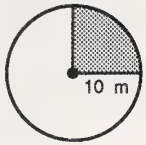
a.



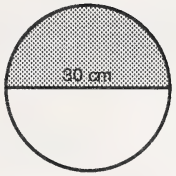
b.



c.



d.



Suggested Answers

1. a. The larger circle has an area of 28.3 cm^2.
The smaller circle has an area of 12.6 cm^2.
The shaded area is 15.7 cm^2.

b. The square has an area of 676 cm^2.
The circle has an area of 530.7 cm^2.
The shaded area is 145.3 cm^2.

c. The circle has an area of 314 m^2.
The shaded area is $\frac{1}{4}$ of the circle, so it has an area of 78.5 m^2.

d. The circle has an area of 706.5 cm^2.
The shaded area is one-half of the circle, so it has an area of 353.3 cm^2.

2. What is the best estimate of the area of a dime?

   a. 10 mm^2

   b. 30 mm^2

   c. 300 mm^2

2. 300 mm^2

3. What is the best estimate of the area of a record?

   a. 45 cm^2

   b. 200 cm^2

   c. 700 cm^2

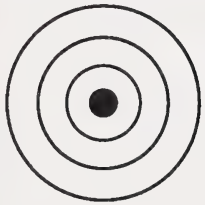
3. 700 m^2

4. What is the best estimate of the area of an archery target?

   a. 1000 cm^2

   b. 10 000 cm^2

   c. 1 000 000 cm^2



4. 10 000 cm^2

5. Which gives you more pizza, two 20-cm pizzas or one 30-cm pizza?

5. One 30-cm pizza gives you more.

6. The signal from a radio station transmitter can be received at locations 150 km away. Find the maximum area served by the radio station.

6. 70 686 km^2

7. a. What happens to the area of a circle when its radius is doubled?

   b. What happens to the area of a circle when its radius is tripled?

7. a. Its area is quadruple the original area.

   b. Its area is nine times the original area.

8. A circular coffee table is made from oak veneer glued to a 2-cm thick plywood base. The veneer costs \$48.75/m^2 and the plywood costs \$10.95/m^2. The table has a diameter of 0.8 m.

   a. What is the area of the table top? (Round to the nearest tenth.)

   b. What is the cost of the veneer used to make the table top?

   c. What is the cost of the plywood used?

   d. If the table top is cut from a 1 m^2 piece, what is the value of the wasted veneer.

   e. What is the value of the wasted plywood under the same circumstances?

8. a. 0.5 m^2

   b. \$24.38

   c. \$5.48

   d. \$24.38

   e. \$5.48

VOLUME OF RIGHT RECTANGULAR PRISMS

What Lies Ahead

In this section the student will learn this skill.

- using a formula to find the volume of right rectangular prisms and cubes

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 6
Measurement and Geometry

base 10 blocks

(optional)

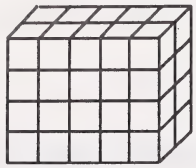
MATHWAYS: Volume

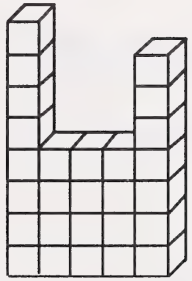
Guiding the Student

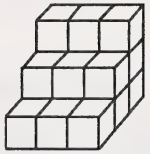
- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

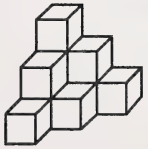
Introductory Activities

1. Find the volume of the following solids. You may use base 10 blocks or sugar cubes to construct the solids first.

a. 

b. 

c. 

d. 

Suggested Answers

1. a. 40 cubic units

b. 27 cubic units

c. 18 cubic units

d. 10 cubic units

2. Use twelve base 10 blocks or sugar cubes for this question.

   a. Stack the cubes to form a rectangular prism with one layer.

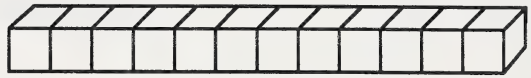
   b. Form a rectangular prism with two layers.

   c. Form a rectangular prism with three layers.

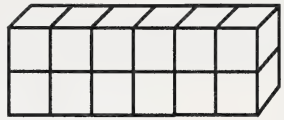
   d. Form a rectangular prism with four layers.

   e. Form a rectangular prism with six layers.

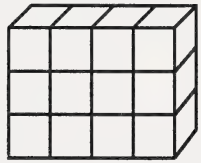
2. a.



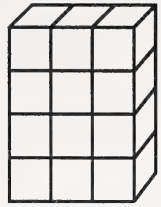
b.



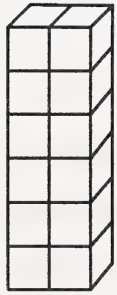
c.



d.



e.



3. What is the volume of each of the rectangular prisms in Question 2?

3. a. 12 cubic units

b. 12 cubic units

c. 12 cubic units

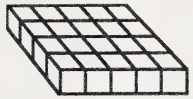
d. 12 cubic units

e. 12 cubic units

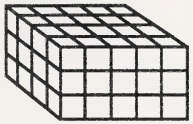
4. Use base 10 blocks or sugar cubes for this question.

   a. What is the volume of this right rectangular prism?

   b. How can you find the volume of this right rectangular prism without counting each block? What is it?



   c. How can you find the volume of this right rectangular prism without counting each block? What is it?



4. a. 5 cubic units

   b. You can find the volume by multiplying the number of blocks in one row by the number of rows.

   20 cubic units

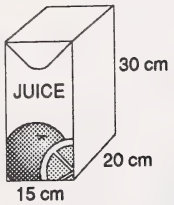
   c. You can find the volume of one layer by multiplying the number of blocks in one row by the number of rows. You can find the total volume by multiplying the number of layers by the volume of one layer.

   60 cubic units

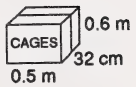
Practice Activities

Calculate the volume of each of the following right rectangular prisms using a formula.

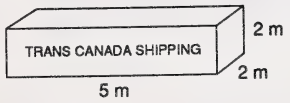
1.



2.



3.



Suggested Answers

1. $V = \ell \times w \times h$
   $= 15 \times 20 \times 30$
   $= 9000$

   The volume is 9000 m^3.

2. $V = \ell \times w \times h$
   $= 0.5 \times 32 \times 0.6$
   $= 9.6$

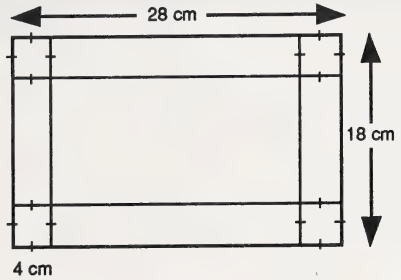
   The volume is 9.6 m^3.

3. $V = \ell \times w \times h$
   $= 5 \times 2 \times 2$
   $= 20$

   The volume is 20 m^3.

Concluding Activities

A pan is made from a rectangular sheet of metal as shown. Squares are cut out of each corner and the sides are folded up. What is the volume of the pan?



Suggested Answers

$V = \ell \times w \times h$

$= 20 \times 10 \times 4$

$= 800$

The volume is 800 cm^3.

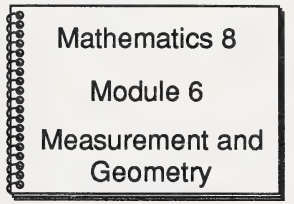
SUMMARY

What Lies Ahead

In this section the student will review the concepts that were learned in Part Two.

Gathering Materials

For this section the student needs these items.



ruler

Guiding the Student

- Emphasize to the students the goal of this section is to review Part Two.
- Help the students check their answers to the pretest in Section 12 and correct any errors.

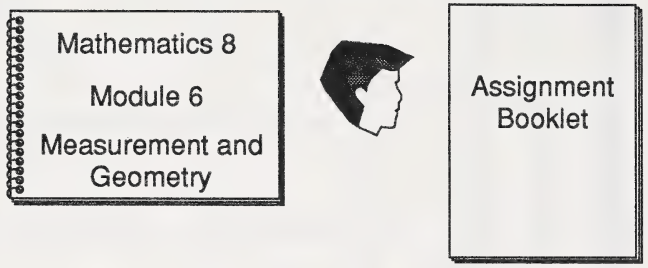
MODULE CONCLUSION

What Lies Ahead

In this section the student will complete the assignment for Module 6.

Gathering Materials

For this section the student needs these items.



Guiding the Student

- Emphasize to the students that the assignment should be done independently.
- Give the students feedback and a grade on their assignment.

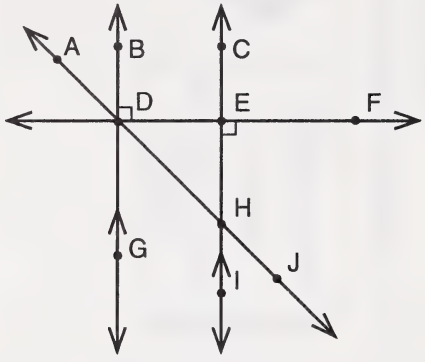
Suggested Answers for Assignment Booklet

Part 1: Multiple-Choice Questions

30

Each of the following questions has four suggested answers, one of which is better than the others. Place the letter of the best answer on the response page at the right.

Use this diagram for Questions 1 and 2.



1. Which of the angles in the diagram is obtuse?

   A. ∠BDH
   B. ∠JHI
   C. ∠CEF
   D. ∠ADH

2. Which statement about the diagram is true?

   A. $\overleftrightarrow{BD} \parallel \overleftrightarrow{AJ}$

   B. $\overleftrightarrow{BG} \parallel \overleftrightarrow{DF}$

   C. $\overleftrightarrow{DF} \perp \overleftrightarrow{CI}$

   D. $\overleftrightarrow{AJ} \perp \overleftrightarrow{CI}$

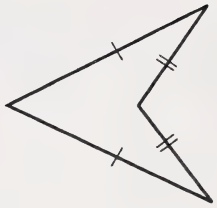
Part 1 Response Page

1. A

2. C

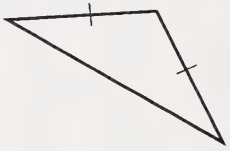
Part 1 (continued)

3. Which of the following names best describes this figure?



A. convex polygon
B. non-simple closed curve
C. simple closed curve
D. concave polygon

4. Which of the following names best describes this figure?



A. acute, isosceles triangle
B. acute, scalene triangle
C. obtuse, scalene triangle
D. obtuse, isosceles triangle

5. Which polygon has diagonals that are perpendicular and bisect each other?

A. rectangle
B. rhombus
C. square
D. trapezoid

6. Which polygon has only one line of symmetry?

A. square
B. rectangle
C. kite
D. rhombus

7. Which polygon is **not** a quadrilateral?

A. kite
B. trapezoid
C. rhombus
D. pentagon

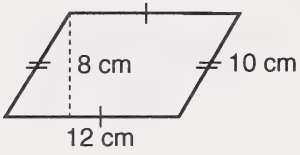
Part 1 Response Page (continued)

3. D
4. D
5. C
6. C
7. D

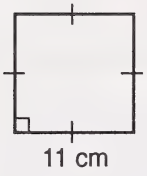
Part 1 (continued)

8. Which figure has the least perimeter?

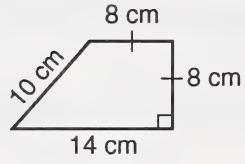
A.



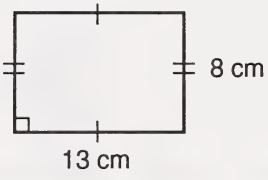
B.



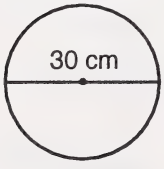
C.



D.



9. What is the approximate ratio of the circumference to the diameter of this circle?



A. 3
B. 15
C. 90
D. 675

Part 1 Response Page (continued)

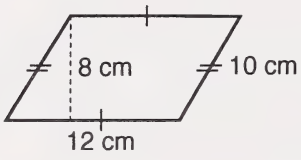
8. C

9. A

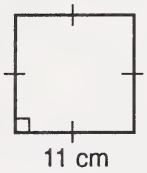
Part 1 (continued)

10. Which figure has the least area?

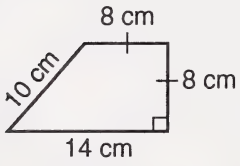
A.



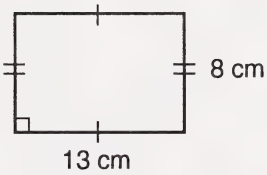
B.



C.



D.



11. Which polygon gives you the greatest area if the perimeters are the same?

A. trapezoid
B. rectangle
C. square
D. rhombus

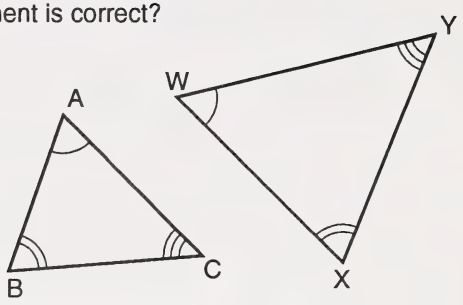
Part 1 (continued)

10. D

11. C

Part 1 (continued)

12. Which statement is correct?



A. $\overline{AB} : \overline{AC} = \overline{XY} : \overline{YW}$

B. $\overline{AB} : \overline{BC} = \overline{WX} : \overline{XY}$

C. $\overline{BC} : \overline{AB} = \overline{XY} : \overline{WY}$

D. $\overline{AC} : \overline{BC} = \overline{WX} : \overline{XY}$

13. How many edges does a right rectangular prism have?

A. 4
B. 6
C. 8
D. 12

14. How many vertices does a right rectangular prism have?

A. 4
B. 6
C. 8
D. 12

15. How many faces does a right rectangular prism have?

A. 4
B. 6
C. 8
D. 12

Part 1 Response Page (continued)

12. B

13. D

14. C

15. B

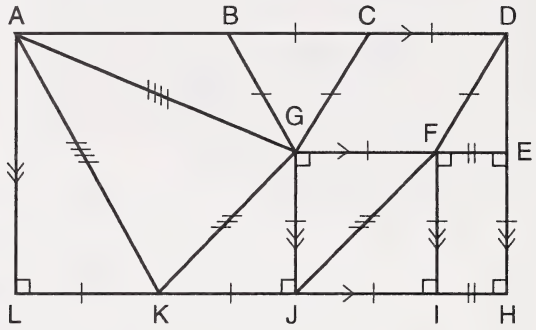
Total for Part 1 = _____ (Maximum possible: 30 marks)

Part 2: Short-Answer Questions

70

Give the complete answers in the spaces provided on the response page at the right.

Use the following diagram for Questions 1 and 2.



8

1. Classify each of the following triangles by two names.

   a. BCG
   b. GJK
   c. ALK
   d. ABG

12

2. Classify each of the following quadrilaterals by its most specific name.

   a. CDFG
   b. GFIJ
   c. AGJK
   d. FEHI
   e. BDFG
   f. GFJK

Part 2 Response Page

1. a. equilateral triangle, equiangular triangle

   b. isosceles triangle, right triangle

   c. scalene triangle, right triangle

   d. scalene triangle, obtuse triangle

2. a. rhombus

   b. square

   c. kite

   d. rectangle

   e. trapezoid

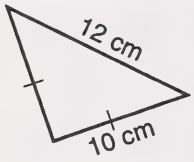
   f. parallelogram

Part 2 (continued)

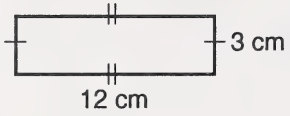
9

3. Find the perimeter of each of the following polygons.

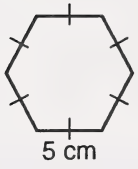
a.



b.



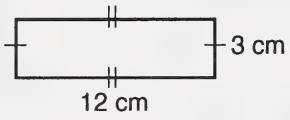
c.



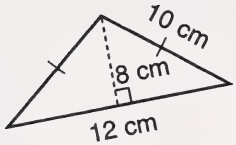
12

4. Find the area of each of the following polygons.

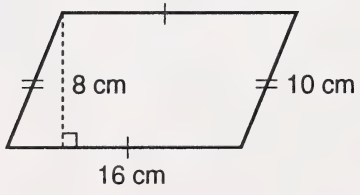
a.



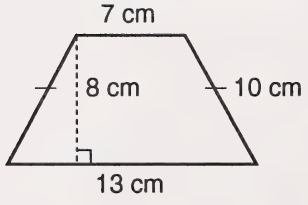
b.



c.



d.



Part 2 Response Page (continued)

3. a. 32 cm

   b. 30 cm

   c. 30 cm

4. a. 36 cm^2

   b. 48 cm^2

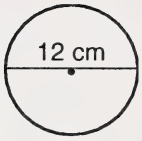
   c. 128 cm^2

   d. 80 cm^2

Part 2 (continued)

6

5. a. Find the area of this circle.

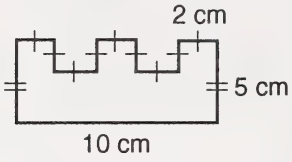


b. Find the circumference of this circle.

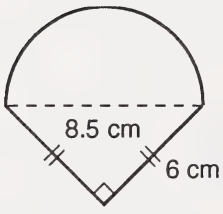
8

6. Find the perimeter of each of these figures.

a.



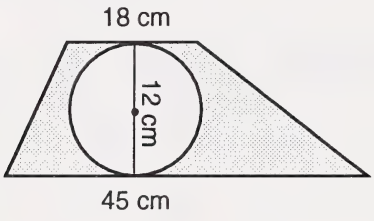
b.



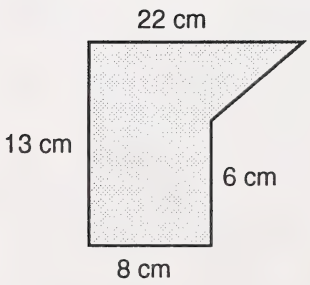
8

7. Find the area of each shaded region.

a.



b.



Part 2 Response Page (continued)

5. a. 113.0 cm^2 (rounded to nearest tenth)

   b. 37.7 cm (rounded to nearest tenth)

6. a. 38 cm

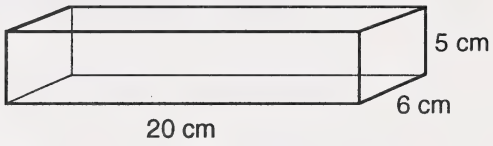
   b. 25.3 cm (rounded to nearest tenth)

7. a. 265.0 cm^2 (rounded to nearest tenth)

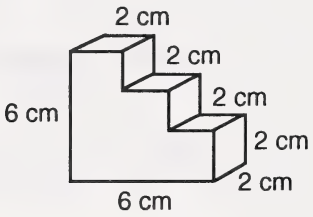
   b. 153 cm^2

Part 2 (continued)

3 8. Find the volume of this right rectangular prism.



4 9. Find the volume of this solid.



Part 2 Response Page (continued)

8. 600 cm^3

9. 48 cm^3

Total for Part 2 = _____ (Maximum possible: 70 marks)

Part 3: Problems

20

Do any **five** of the following six problems. Give complete answers on the response page at the right. Be sure to clearly show how you arrive at your answer.

4 1. The minute hand of a certain clock is 8 cm long. How far does the tip of that hand travel in a 4-hour period?

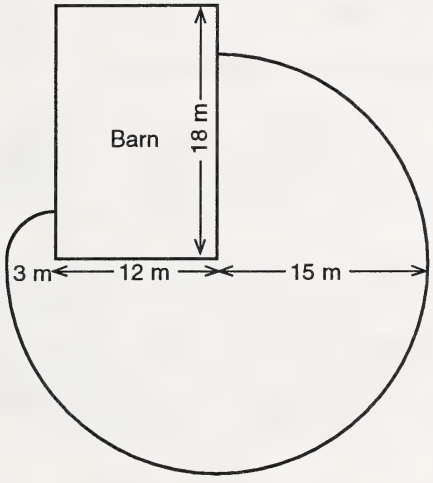
4 2. A goat is tied to the corner of a barn by a 15 m rope. If the barn is 12 m wide by 18 m long, make a diagram to show how much area the goat has to roam.

4 3. Make a diagram to show how a rectangle 8 cm long and 3 cm wide can be cut into pieces and rearranged to make a rectangle 12 cm long and 2 cm wide.

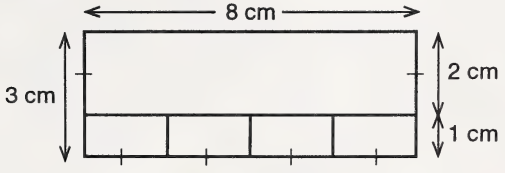
Part 3 Response Page

1. The hand travels 8.4 cm (rounded to nearest tenth).

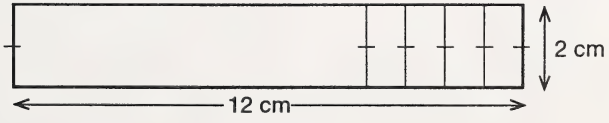
2.



3. Original Rectangle (8 cm by 3 cm)



New Rectangle (12 cm by 2 cm)



Part 3 (continued)

4

4. 27 small white cubes are stacked together to form a large cube, and the faces of the large cube are then painted red. How many small cubes have the following?

   a. 1 red face
   b. 2 red faces
   c. 3 red faces
   d. 4 red faces

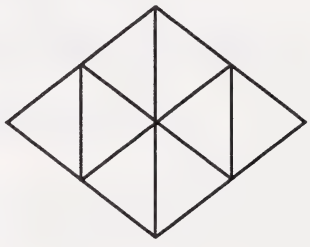
4

5. Here four views of the same block.

   What letters are on the opposite faces of the block?

4

6. The diagram below shows sixteen toothpicks arranged to make eight small equilateral triangles and two large equilateral triangles. Draw a diagram to show how you can remove four toothpicks so that there are only four small equilateral triangles left.



Part 3 Response Page (continued)

4. a. 6

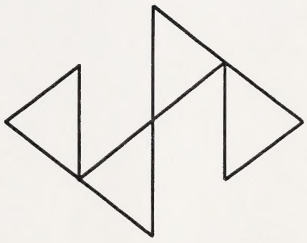
   b. 12

   c. 8

   d. 0

5. B and E, A and F, and B and D are opposite faces.

6. Answer should look like this.



Total for Part 3 = _____ (Maximum possible: 20 marks)

MATH 8

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